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MINERALOGICAL ABSTRACTS

Vol. 14—No. 7 September 1960

AGE DETERMINATION AND ISOTOPE MINERALOGY

STIL (GORDON). *The distribution of mineral dates in time and space.* Amer. Journ. Sci., 1960, **258**, 1-35, 6 figs.

Statistical study of the frequency with which age observations based on radioactivity fall in various intervals of time shows striking periodicity of distribution in time, both on a worldwide and on a continent-by-continent basis. Mineral abundance abundances show peaks at the following age intervals: 0 to 120, 280 to 620, 930 to 1100, 1300 to 1480, 1650 to 1860, 2030 to 2220, 2490 to 2710, and > 2940 m.y. These intervals comprise 45% of the time covered, but contain 71% of the observations, thus supporting the idea of rather regular mineralogical cycles. A composite of U-Th-Pb dates tends to be older than Rb-Sr; K-A dates are nearly the same as Rb-Sr but probably a little younger. Nevertheless, the different methods lead to very similar results, for the differences, if any, are small. Younger mineral date provinces occur near the margins in North America, but the pattern differs in different continents.

H. W.

TERWALD (F. W.). *Discussion of paper by Gast, Kulp and Longon 'Absolute age of early Precambrian rocks in the Bighorn Basin of Wyoming and Montana, and South-eastern Manitoba'.* Journ. Geophys. Res., 1959, **64**, 269-270.

It is suggested that the age of the biotite from the Bighorn Mountains determined by Gast, Kulp, and Long [M.A. 314] may relate to more than one event in the complex Precambrian history of the range. The evidence presented by Gast, Kulp, and Long indicated a widespread, single, major regional metamorphism [with an age of 2750 ± 150 m.y.] in Montana and Manitoba, but it is not clear where this metamorphism fits within the sequence of events in the Bighorns.

F. R. B.

FARQUHAR (R. M.). *Third annual report of the committee on Precambrian and related dating.* Trans. Roy. Soc. Canada, Sect. 4, 1957, **51**, 39-43, 1 table.

A brief summary of progress in methods of age determination and of results on Canadian rocks is given together with a table of the significant results which have appeared in the literature during the past year.

E. W. N.

GRETENER (P. E. F.), FARQUHAR (R. M.), & WILSON (J. T.). *Ages of some African minerals.* Trans. Roy. Soc. Canada, Sect. 4, 1954, **48**, 17-32, 2 figs., 7 tables.

The ages of 45 African lead and radioactive mineral specimens determined at the University of Toronto and of a number determined elsewhere are given together with a critical discussion of the methods employed. The subdivision of the Precambrian in southern Africa and in Canada into geological provinces is compared.

E. W. N.

BEVERIDGE (A. J.) & FOLINSBEE (R. E.). *Dating Cordilleran orogenies.* Trans. Roy. Soc. Canada, Sect. 4, 1956, **50**, 19-43, 14 figs., 1 table.

K/A and Pb/α dates for a number of volcanic and plutonic rocks suggest a main period of Cordilleran batholithic emplacement in Mid-Cretaceous time, 100 m.y. ago, and a late phase of magmatic intrusion in early Laramide time, 70 m.y. ago. Studies of the accessory minerals from intrusive rocks of the Cordilleran orogenic belt and from Cretaceous sedimentary rocks of the Alberta foothills region suggest, however, that granitic intrusions were emplaced and unroofed in the Cordilleran area during Lower Cretaceous time.

E. W. N.

ALDRICH (L. T.), WETHERILL (G. W.), DAVIS (G. L.), & TILTON (G. R.). *Radioactive ages of micas from granitic rocks by Rb-Sr and K-A methods.* Trans. Amer. Geophys. Union, 1958, **39**, 1124-1134, 1 fig., 9 tables.

Rb/Sr and K/A ages of micas from pegmatites and granites are compared with each other and with U-Pb ages obtained for coexisting zircon, uraninite, and other minerals. The 63 samples studied are mainly from North America, but include some from Africa. The age range is approximately from 100 to 2900 m.y. K-A and Rb-Sr measurements on micas are in good agreement with concordant U-Pb ages on associated minerals. K-A and Rb-Sr ages on micas from granites and pegmatites generally agree, but if they do not neither age can safely be considered to be absolute. 12 granites and pegmatites from the Rocky Mountains have ages close to 1350 m.y. and this may indicate granitic rock

formation on a large scale at that time. An appendix describes the localities of the specimens studied.

F. R. B.

MAWDSLEY (J. B.) & FARQUHAR (R. M.). *Report of the committee on Precambrian and related dating*. Trans. Roy. Soc. Canada, Sect. 4, 1955, **49**, 37-45, 1 table.

The U/Pb and Th/Pb, the galena, the $^{40}\text{Ar}/^{40}\text{K}$, and the Rb/Sr methods for age determinations are reviewed. The facilities available for age studies in Canada are briefly described. A table giving recent age determinations on Canadian rocks and minerals is included. E. W. N.

FARQUHAR (R. M.) & CUMMING (G. L.). *Isotopic analyses of anomalous lead ores*. Trans. Roy. Soc. Canada, Sect. 4, 1954, **48**, 9-16, 1 fig., 4 tables.

The high $^{206}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$ ratios of 'anomalous' leads suggest association with much higher than normal concentrations of uranium and thorium and resulting acquisition of unusual amounts of radiogenic lead. A comparison of anomalous leads from Sudbury, Noranda in Quebec, the Bunker Hill and Sullivan mines in Idaho, and from the Tri-State district indicates that such acquisition has taken place on vastly different scales, and possibly through very different processes. The existence of this anomalous class of lead ores may provide a physical criterion for differentiating the magmatic type from sedimentary ores which have been associated in disseminated form with near-surface rocks for some period of time before concentration. E. W. N.

CLAYTON (R. N.) & EPSTEIN (S.). *The relationship between $\text{O}^{18}/\text{O}^{16}$ ratios in coexisting quartz, carbonate and iron oxides from various geological deposits*. Journ. Geol., 1958, **66**, 352-373.

Analytical techniques for the extraction of oxygen for isotope analyses involving high-temperature reduction of minerals with carbon are described and compared with the fluorination method. The reduction techniques give reliable results for quartz and iron oxides but not for most silicates. Oxygen isotope analyses are reported for forty-seven samples of genetically associated carbonates, quartz, and iron oxides. The relationships between the oxygen isotope compositions of the coexisting minerals are consistent with those reasonably expected from thermodynamic considerations of isotopic fractionation. The implications of the oxygen isotope data on the problems of temperature measurements, on the presence or absence of chemical equilibrium between mineral phases, and on the study of isotopic compositions and relative amounts of hydrothermal waters in contact with the minerals are discussed. H. L.

BARKER (H.). *Radiocarbon dating*. Nature, 1959, **184**, 672-674.

Report of a joint session of Sections A (Physics) and (Anthropology and Archaeology) of the British Association at its 1959 meeting at York. C. H. F.

GODWIN (H.). *Carbon-dating conference at Groningen September 14-19, 1959*. Nature, 1959, **184**, 1365-1366. C. H. F.

BROECKER (W. S.), OLSON (E. A.), & ORR (P. C.). *Radiocarbon measurements and annual rings in cave formations*. Nature, 1960, **185**, 93-94.

Radiocarbon dating suggests that the rings observed in travertine coating a human femur found in Moaning Cave, California, are annual. The femur is concluded to be 1400 ± 250 years old and is coated with 8.8 cm of travertine in which 1206 rings have been counted. D. McE.

KUPSCH (W. O.). *Radiocarbon-dated organic sediment from Herbert, Saskatchewan*. Amer. Journ. Sci., 1960, **258**, 282-292.

Willow wood from a depth of 11 feet in a former lake gives a radiocarbon age of 10050 ± 300 years. Interpretation of pollen analysis is given. H. V.

ENGEL (A. E. J.), CLAYTON (R. N.), & EPSTEIN (S.). *Variations in isotopic composition of oxygen and carbon in Leadville limestone (Mississippian, Colorado) during its hydrothermal and metamorphic phases*. Journ. Geol., 1958, **66**, 374-393.

Isotopic analyses of the oxygen and carbon of several two specimens of the Leadville limestone and of replacement of the limestone are reported. The oxygen isotope composition of the unaltered Leadville limestone, dolomite and chert is approximately that of similar sedimentary rocks of pre-Mesozoic age. The isotopic fractionation between calcite and quartz suggests that the beds crystallized at near-surface temperatures. By contrast, the oxygen isotope values shown by the quartz and carbonates of hydrothermal Leadville dolomites indicate much higher temperatures. Highest temperatures are indicated at the ore and at conduits; progressively lower temperatures towards the perimeter of the region of dolomite alteration. It is suggested that measurement of the variation in isotopic composition of oxygen may prove useful as a guide to ore. H. L.

BISHOP (K. F.) & TAYLOR (B. T.). *Growth of the triatomic content of atmospheric molecular hydrogen*. Nature, 1960, **185**, 26.

Recent determinations show that the abundance of

trium in atmospheric hydrogen has been approximately doubling every 18 months because of release and dispersal of artificial tritium.

D. McK.

CHAEFFER (OLIVER A.). *Cosmogenic rare gas contents of iron meteorites*. *Physics Today*, 1960, **13**(2), 18-22, 6 figs., 2 tables.

The author describes a method for measuring very small concentrations of rare gas isotopes. His technique is capable of measuring amounts of helium, neon, and argon as low as 10^{-9} , 10^{-10} , and 10^{-9} cc respectively at NTP. A method is proposed for using these and other isotope concentrations to determine the time during which a particular meteorite had been exposed to cosmic radiation before entering the earth's atmosphere as well as the time it has been on the earth.

R. G. Wls.

HIGAZY (RIAD A.) & EL-RAMLY (M. F.). *Potassium-Argon ages of some rocks from the Eastern Desert of Egypt*. *Geol. Surv. & Mineral Resrcs. Dept., Cairo*, 1960, Paper no. 7, 1-19, 1 fig. (Summary in Arabic).

The results of 20 age determinations for some igneous rocks and minerals from the Eastern Desert are given. The absolute ages were determined by the K/A method at the U.S.S.R. Academy of Sciences. The authors conclude that igneous intrusions and volcanic activity seem to have taken place in Egypt in the following ages: Late pre-Cambrian or Eocambrian (600-590 m.y.), Lower Cambrian-Ordovician (470-420 m.y.), Ordovician-Silurian (410-340 m.y.), Silurian-Devonian (300-285 m.y.), Upper Cretaceous (80-75 m.y.), and Tertiary (55-40 m.y.).

E. M. El S.

APPARATUS AND TECHNIQUES

Various; optical; d.t.a.; X-ray

FULLER (L. D.). *The micropanner—an apparatus for the gravity concentration of small quantities of materials*. *Trans. Inst. Mining Metall., London*, 1959, **68**, 1-7, 4 pls.

The micropanner is intended primarily for use on the stage of a stereoscopic microscope and is designed for the gravity concentration and separation of very small quantities of minerals. It may be used in conjunction with water or heavy liquids and can take 4 g to 50 mg samples. An example is given of the separation of zircon for age determination from a 56 mg zircon-rutile-kyanite concentrate from a Glen Urquhart gneiss.

R. A. H.

VALVANO (J. A.) & MILLMAN (A. P.). *Application of selective iridescent filming in ore microscopy*. *Trans. Inst. Mining & Metall., London*, 1959, **68**, 311-320.

Immersion of polished sections of ore minerals in oxidizing reagents, under standard conditions of temperature, time, and concentration of reagents, produces a thin film of varying thickness on different minerals giving rise to characteristic iridescent interference colours [M.A. 7-282, 104]. Tables are given of new data for jamesonite, boulangerite, zinckenite, meneghinite, bournonite, geocronite, semseyite, galena, and some sulphide and sulphosalts of Fe, Ni, Cu, Ag, Sb, and Bi. Although the method cannot be generally used as a reliable means of mineral identification it may be successfully employed for the rapid discrimination of minerals in concentrates or tailings at a mine.

R. A. H.

WILLIAMS (PAUL L.). *A stained slice method for rapid determination of phenocryst composition of volcanic rocks*. *Amer. Journ. Sci.*, 1960, **258**, 148-152, 1 fig.

Sodium cobaltinitrite staining of HF-etched macro-slices

from hand specimens facilitated the quantitative study of Tertiary ignimbrites in the Quichapa formation, Utah and Nevada.

H. W.

HALLIMOND (A. F.). *A new method for orthoscopic adjustment with the Federov stage*. *Min. Mag.*, 1959, **32**, 245-250, 4 figs.

Accurate setting of an optic symmetry plane is accomplished by using the variation in sensitivity of the setting of both the inner vertical (A_1) axis and the north-south (A_2) axis of the 4-axis universal stage for different positions of the east-west (A_4) axis. A bi-quartz plate is recommended in preference to use of adjustment to extinction, except in the neighbourhood of an optic axis where the bi-quartz plate is insensitive. [M.M. 31-860; M.A. 8-350]

W. S. M.

SHAMS (F. A.). *Efficiency of Federov-stage as a stage-goniometer*. *Pakistan Journ. Sci. Res.*, 1956, **8**, 84-85.

The Federov stage has been used as a stage goniometer mounted on the stage of an ore-microscope. The procedure for setting crystals and measuring interfacial angles is described. The range of error is $\pm 5'-10'$.

J. Ph.

BORDET (P.). *Un objectif à axe optique incliné pour le microscope polarisant*. *Bull. Soc. franç. Min. Crist.*, 1959, **82**, 234-238, 5 figs.

A specially designed objective enables the inclination of the optic axis of a uniaxial crystal to the microscope axis to be determined. For biaxial crystals the optic axial angle can be measured directly without recourse to a universal stage.

R. A. H.

BAUER (J.). *Metodika pozorování osních obrazců kulovými čočkami* [Method of axial figure observation by means of ball glasses]. *Silikáty*, 1958, **2**, 178-190, 18 figs., 3 tables.

The thick lenses for observing interference axial figures are replaced by small ball glasses (method of N. M. Melancholin and S. V. Grum-Grzhimailo, 1954). Axial figures on the ball glasses may be observed either by thin lenses or by the Amici-Bertrand lens alone. The crystal surface and the axial figure can be observed simultaneously. A new method of fixing a ball glass of greater diameter to the polarizing microscope is proposed for use in 'defecto-conoscopy' of crystals. [M.M. 30-666] J. K.

[MOZZHERIN (YU. V.)] Мозжерин (Ю. В.). Приемы коноскопирования объективами небольших увеличений на столике Федорова [*Conoscopy methods with low magnification objectives on the Fedorov stage*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 490-491.

A detailed description of the application of conoscopic methods for the accurate measurement of the optic axial angle or dispersion by means of a Fedorov stage. This method was made possible by the production of a special objective and a special condenser. Interference figures can be observed on grains down to 0.05 mm. in diameter.

S. I. T.

[KHLESTOV (V. V.)] Хлестов (В. В.). Номограмма для определения угла оптических осей методом А. Н. Заварицкого [*Nomogram for the determination of the optic axial angle by the A. N. Zavaritzky method*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 700-701, 1 fig.

In the 'Universal stage of E. S. Fedorov' (Publ. Acad. Sci. U.S.S.R., 1953) A. N. Zavaritzky proposed a new method of determination of 2V when the optic axes are not directly observable. The present author provides nomograms for Zavaritzky's formula. [M.A. 11-156] S. I. T.

[RASUMOVSKY (N. K.)] Разумовский (Н. К.). Цилиндрические препараты для изучения показателей преломления минералов иммерсионным методом [*Cylindrical gadgets for the study of indices of refraction of minerals by the immersion method*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 708-709.

A method is described in which capillary tubes containing mineral grains are used for the determination of refractive indices of minerals under the microscope.

S. I. T.

CAHN (J. W.). *A quantitative correction for the Holmes effect*. Amer. Min., 1959, **44**, 435-437.

In measurement of convex particles in thin section there is a tendency to measure projected area instead of the area of intersection with the surface of the section. Equations are given for correction of this effect.

B. H. B.

CAHN (J. W.) & HILLIARD (J. E.). *The measurement of grain contiguity in opaque samples*. Trans. Metallurgical Soc., A.I.M.E., 1959, **215**, 759-761.

The authors consider the degree of contact between grains which are not constant-size spheres. They suggest that the degree of contact be described by three parameters which can be determined from measurements on a randomly polished section. A table summarizes the parameters measurable on the plane of polish. An expression is derived for the number of contacts per unit volume, and it is shown that this quantity cannot usually be estimated from measurements on the polished section. R. G. WILSON

KOPP (OTTO C.) & KERR (PAUL F.). *Differential thermal analysis of evaporates*. Amer. Min., 1959, **44**, 674-682, 2 figs.

Modified d.t.a. equipment and its method of use are described. The observable d.t.a. range is extended beyond the melting point of the mineral without encountering the difficulties noted for analyses made with unprotected thermocouples.

A. C. HILL

FITCH (J. L.) & HURD (B. G.). *A sample holder for differential thermal analysis of fusible or reactive samples*. Amer. Min., 1959, **44**, 431-433, 2 figs.

Platinum sample holders 12 mm deep and 12 mm diameter with a closed-end centre well are used for fusible or reactive d.t.a. samples. The thermocouple itself, standing vertically, is used to support the sample holder. Good resolution with low drift is claimed.

B. H. B.

SCHEDLING (J. A.). *Differentialthermoanalyse*. Rad. Rundschau, 1959, no. 4, 600-611, 17 figs. (German with English and French summaries).

D.t.a. methods, applications, and equipment are reviewed. A diagram is given of equipment for use in the range between -160°C and room temperature.

A. G. C.

ROCHE (F.) & MÉRIEL (P.). *Programme de raffinement des structures cristallines sur machine électronique*. Bull. Soc. franç. Min. Crist., 1959, **82**, 273-276.

Details are given of a computer programme which allows the determination of the positions of atoms in a crystal structure from an X-ray powder pattern by the method of least squares. The space group and approximate atomic positions should be known.

R. A. H.

ROHNER (F.). [*Application of the X-ray diffractometer to bauxite analysis*. Chimia, 1958, **12**, 287-291.] Abstr., 1959, **6**, abstr. 2998.

The boehmite and diasporite contents of bauxite are obtained by measurements of the intensity of the X-ray reflections at 6.15Å and 3.97Å respectively, based on a calibration curve obtained from known mixtures. The ease with which a bauxite sample can be decomposed is directly related to its boehmite content. R. A. H.

GIHARA (HITOSI), YAMASHITA (SHUJI), & TAKEDA (AKITSU). *Use of synthetic quartz crystals as a support for specimens in powder photographs*. *Nature*, 1959, **183**, 1666-1667, 2 figs.

Thin needle-shaped crystals, elongated parallel to *c*, and uniform cross-section, have been grown by the temperature gradient method. These crystals make excellent supports for powder specimens. The photographs have uniform backgrounds and the diffraction pattern from the quartz crystal can be helpful in the interpretation of the photographs. C. H. K.

CKLE (E. R.). *Thermogravimetric analysis: The method of isobaric dehydration*. *Journ. Phys. Chem.*, 1959, **63**, 1231-1235.

An improved spring balance technique allows quasi-static recording of dehydration. Dehydration temperatures are sharply resolved except where complicated by very slow reaction rates. Data for calcites, portlandite, and calcium silicate hydrates. W. T. H.

SWIS (D. R.), WHITAKER (T. N.), & CHAPMAN (C. W.). *Thermoluminescence of rocks and minerals. Part I. An apparatus for quantitative measurement*. *Amer. Min.*, 1959, **44**, 1121-1140, 9 figs., 2 tables.

An apparatus permitting quantitative measurement of thermoluminescence, from glow curves of intensity against temperature, has been developed. A sample of 50 mg or less is generally used. The rate of heating samples can be varied from 10 to 100°C per minute with a maximum deviation from linearity of $\pm 2^\circ\text{C}$; the heating range varies from room temperature to 600°C. A 6217 photomultiplier tube is used giving broad spectral response and high sensitivity. Careful standardization and selection of components limits the total errors in the glow curve to about 1%. B. H. B.

Chemical ; spectrographic

RILEY (J. P.) & WILLIAMS (H. P.). *The microanalysis of silicate and carbonate minerals. Part III. Determination of silica, phosphorus pentoxide and metallic oxides*. *Mikrochim. Acta*, 1959, 804-824, 1 fig.

Si is determined spectrophotometrically using a 5 mg sample after fusion with NaOH. P and the metallic

elements are determined on a 25 mg sample decomposed with a mixture of hydrofluoric and perchloric acids. Fe is determined spectrophotometrically as its complex with sulphonated bathophenanthroline, Ti with phenylfluorone, and Mn with formaldoxime. Ca and Mg are determined with EDTA using a photoelectric titrimeter after removal of interfering elements by extraction of their complexes with 8-hydroxyquinoline. Triplicate analyses of granite G-1 and diabase W-1 are in good agreement with earlier results. R. A. H.

RILEY (J. P.) & WILLIAMS (H. P.). *The microanalysis of silicate and carbonate minerals. IV. Determination of aluminium in the presence of interfering elements*. *Mikrochim. Acta*, 1959, 825-830.

The majority of interfering elements are removed by extraction with a chloroform solution of 8-hydroxyquinoline at pH 10, prior to extraction and photometric estimation of Al with 8-hydroxyquinoline in chloroform at pH 4.5. Additional extractions are detailed for Ti, Zr, and U which are not completely removed by this process. Satisfactory recoveries of 50 µg of Al were obtained in the presence of at least 4 times this weight of Be, Bi, Cd, Ce, Co, Cr, Cu, Dy, Fe, Ga, Mo, Ni, Pb, Ti, U, V, W, Y, Zn, or Zr. R. A. H.

IVANOVSKIĬ (B.V.) & VOLODINA (I. N.). [*Determination of the mineral composition of carbonate rocks*. *Zap. Leningr. Gorn. Inst.*, 1958, **33**, 236-242.] *Anal. Abstr.*, 1960, **7**, abstr. 1034.

The method makes use of the differing rates of reaction of calcite and dolomite with HCl in the cold and the property of magnesite of reacting with HCl only on warming. The form of the curves defining the volume of liberated CO₂ as a function of time gives the approximate amounts of the separate minerals. R. A. H.

[SENDEROVA (V. M.)] Сендерова (В. М.). Методы химического анализа гипогенных и гипергенных минералов висмута [*Methods of chemical analysis of the hypogene and hypergene bismuth minerals*]. Труды Минер. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 121-136.

Detailed procedures for quantitative complete analyses of a large number of bismuth-containing minerals are given [M.A. 14-5]. S. I. T.

OZHIGOV (E. P.). [*Detection of zinc in ores by a grinding method*. *Soobshch. Dal'nevost. Fil. Akad. Nauk SSSR*, 1958, 127-129.] *Anal. Abstr.*, 1959, **6**, abstr. 2053.

Copper tetrathiocyanatomercurate produces a dark lilac colour whose intensity is proportional to the content of Zn. The detectable minimum is ≈ 0.2 mg of Zn. R. A. H.

SOLNTSEV (N. I.) & CHUDINA (R. I.). [Use of amperometry in the phase analysis of zinc compounds in ores and enrichment products. Sb. Nauk. Trud. Gos. Nauk.-Issled. Inst. Tsvet. Met., 1958, 103-111.] Anal. Abstr., 1959, **6**, abstr. 1213.

The total content of Zn in ores is determined by amperometric titration in an ammoniacal citrate medium. The selective solution and determination of Zn in calamine and adamite, smithsonite, descloizite, and blende is described.

R. A. H.

BURKSER (E. S.) & KORNIENKO (T. G.). [Rapid method for the determination of rubidium in silicate minerals. Ukr. Khim. Zhur., 1958, **24**, 375.] Anal. Abstr., 1959, **6**, abstr. 4281.

The radioactive isotope ^{86}Rb is used to establish the loss of Rb (20 to 50%) in the determination of Rb in silicates by a gravimetric method. A known amount of ^{86}Rb is added and the radioactivity of the final precipitate is compared with that of a similar amount of ^{86}Rb as was added; a correction can thus be made to the Rb value obtained. The method has been used to determine Rb in biotites.

R. A. H.

YASHCHENKO (M. L.), OVCHINNIKOV (G. V.), & AFANAS'YEVA (L. I.). [Determination of alkali metals. Reports of the Fifth Session on the Determination of the Absolute Age of Geological Formations, Moscow, 1956. Akad. Nauk SSSR, 1958, 296-307.] Anal. Abstr., 1960, **7**, abstr. 871.

Rb and Cs are removed from K by extraction of the chlorides with ethanol, the separation of Rb and K as chloroplatinates, the removal of Cs from Rb and K with $(\text{NH}_4)_2\text{SO}_4$ solution, etc. These procedures can be used for the determination of Rb and Cs in mica.

R. A. H.

GADOMSKI (M.). Rubidium, caesium and thallium in pegmatitic mica minerals. Arch. Mineralogiczne, 1958, **22**, 207-225, 2 figs. (In English.)

R. A. H.

MORRIS (D. F. C.) & KILLICK (R. A.). The determination of silver in galena and blende by radioactivation analysis. Anal. Chim. Acta, 1959, **20**, 587-594, 2 figs.

Full details are given for the application of neutron-activation analysis to the determination of trace amounts of Ag. Co-existing galena and blende from Milltown Mine, Tulla, Co. Clare, Eire, had mean Ag contents of 0.104 and 0.110% for the galena and 0.00075% for the blende: standard deviation is better than $\pm 3\%$. [M.A. 13-332]

R. A. H.

FOX (E. J.) & JACKSON (W. A.). Steam distillation of fluorine from perchloric acid solutions of aluminiferous ores. Anal. Chem., 1959, **31**, 1657-1662, 7 figs.

R. A. H.

VISHVESHVARAIAH (K. N.) & PATEL (C. C.). [Gravimetric estimation of lithium as trilithium phosphate. Jour. Indian Inst. Science, 1959, **41**, A, 16, 5 tables.] B. Ceram. Abstr., 1959, abstr. 2313.

A method has been developed of precipitation from homogeneous medium of 60% ethanol employing a reagent of pH 9.5, prepared by mixing β -diethyl amino ethyl alcohol and orthophosphoric acid. By this method it is possible to estimate Li in a solution containing from 5 to over 100 mg even in the presence of Na and/or K to the extent of five times the weight of Li. The method works satisfactorily in the presence of anions such as chloride, sulphate, phosphate, and nitrate.

A. G. C.

SHNEIDER (L. A.). [Determination of lithium in spodumene ores. Obogashchenie Rud., 1958, 41-42.] Anal. Abstr., 1960, **7**, abstr. 362.

The usual methods of attack on spodumene ores involving an $\text{HF-H}_2\text{SO}_4$ treatment or fusion with alkali sulphates do not ensure the quantitative extraction of Li. A method is described based on the decomposition of the ore by ignition with a mixture of CaCO_3 and NH_4Cl .

R. A. H.

KONDRAKHINA (E. G.) & SONGINA (O. A.). [Determination of chromic oxide, total iron and ferrous oxide in chromite ores and chromomagnesite refractory materials. Trudy Inst. Stroit. i Stroimaterial., Akad. Nauk Kaz. SSR, 1958, **1**, 149-159.] Anal. Abstr., 1959, **6**, abstr. 144.

Details are given of an amperometric method used after decomposition of the samples with a mixture of sulphuric and phosphoric acids or by fusion with sodium peroxide with a protective layer of sodium carbonate.

R. A. H.

FAYE (G. H.). Decomposition of niobium-bearing ores of rocks. Aspects of the determination of niobium by thiocyanate. Chem. Canada, 1958, **10**, 90-96.

The decomposition of Nb-bearing ores by acid attack with $\text{HF-HCl-H}_3\text{PO}_4$ is recommended. In the presence of U the photometric determination of Nb with thiocyanate gives low results. A method of treatment of the solution with tartaric acid is described.

R. A. H.

ZAĖKOVSKIĖ (F. V.) & BASHMAKOVA (V. S.). [Photometric determination of total rare-earth elements in ores of rocks. Zhur. Anal. Khim., 1959, **14**, 50-54.] Anal. Abstr., 1959, **6**, abstr. 4318.

Details are given for determining the rare earths by making use of the arsenazo complexes of the cerium and praseodymium groups. The method permits the determination of 0.1 to 3% of rare earths with errors of 5 to 20%.

R. A. H.

STANTON (R. E.) & COOPE (J. A.). *Modified field test for the determination of small amounts of nickel in soils and rocks*. Trans. Inst. Mining Metall. London, 1959, **68**, 9-14, 1 fig.

A modification of methods already in use, but unpublished, for the determination of minute amounts of Ni salts in soils is described. A nickel furildioxime complex extracted with benzene is used in colorimetric comparisons with a series of standards similarly prepared. The Ni content can be determined in the concentration range 1 to 15,000 p.p.m. of Ni and a productivity of 80-100 determinations per man-day is achievable with an accuracy of $\pm 25\%$. [M.A. **13-75**]

R. A. H.

BRAKE (L. D.), McNABB (W. M.), & HAZEL (J. F.). *A spectrophotometric method for the determination of nickel*. Anal. Chim. Acta, 1958, **19**, 39-42.

Up to 20 mg of Ni can be determined with a maximum deviation of ± 0.10 mg using a spectrophotometric method with versene (EDTA) at 1000μ . [M.A. **13-512**]. R. A. H.

BAKSOVA (Z. A.). [Determination of small amounts of lead in rocks. Zhur. Anal. Khim., 1959, **14**, 75-80.] Anal. Abstr., 1959, **6**, abstr. 4332.

Six methods for the extraction of Pb are compared. Extraction of Pb diethyldithiocarbamate with amyl alcohol and toluene gave 97% extraction. R. A. H.

GRACIAS (C. E.). [Photometric determination of tantalum in the presence of titanium. Técnica, Lisbon, 1957, **31**, 433-439]. Anal. Abstr., 1958, **5**, abstr. 4073.

The colour reaction of Ta with pyrogallol can be used for the photometric determination of Ta even in the presence of up to 60% Ti. In acid medium Nb causes practically no interference. The procedure for minerals is given in detail. [M.A. **13-258**]

R. A. H.

GULLUM (D. C.) & THOMAS (D. B.). *The determination of barium and sulphate with an E.E.L. flame photometer*. Analyst, 1959, **84**, 113-116.

R. A. H.

BOND (R. D.) & HUTTON (J. T.). *The use of sulphuric acid to depress the interference of calcium in the determination of sodium with an E.E.L. flame photometer*. Analyst, 1958, **83**, 684-686.

R. A. H.

BULYCHEVA (A. I.) & MEL'NIKOVA (P. A.). [Determination of free silica in the presence of silicates with pyrophosphoric acid. Akad. Nauk SSSR, 1958, 23-32.] Anal. Abstr., 1960, **7**, abstr. 424.

POLEZHOEV (N. G.). [New method for determining free silica in the presence of silicates. Ibid., 33-43.] Ibid., 425.

IL'IN (A. N.). [Determination of quartz in the presence of silicates by a kinetic method. Ibid., 72-77.] Ibid., 426.

These three papers form part of a Moscow symposium on the determination of free silica in rocks and ore dust. The method for the determination of quartz in the presence of silicates makes use of the insolubility of quartz mixed with Na_2SiF_6 in phosphoric acid at $260^\circ\text{--}270^\circ\text{C}$, at which temperature silicates decompose.

R. A. H.

NECHAEVA (E. A.) & LAPIDUS (É. S.). [Complexometric determination of the sum of titanium and aluminium in clay. Zavod. Lab., 1959, **25**, 544-545.] Anal. Abstr., 1960, **7**, abstr. 1035.

Following Na_2CO_3 fusion the solution is treated with EDTA, neutralized, and titrated with zinc acetate. It is then boiled with NaF solution, thus decomposing the Al and Ti complexes, and when cool the liberated EDTA is titrated with further zinc acetate.

R. A. H.

STEELE (T. W.). *The volumetric determination of uranium after reduction by lead in dilute perchloric acid solution*. Analyst, 1960, **85**, 55-62, 1 fig.

A rapid volumetric method for the determination of U in high-grade ores involves boiling a dilute solution of the sample in perchloric acid, its reduction with granular lead, the addition of ferric perchlorate, and titration with potassium dichromate. Interfering elements can be removed by precipitation with cupferron in the perchloric acid solution. [M.A. **14-11**]

R. A. H.

SILVERMAN (H. P.) & BOWEN (F. J.). *Pyrohydrolysis of cryolite and other fluoride-bearing materials*. Anal. Chem., 1959, **31**, 1960-1965.

The fluorine content of cryolite is determined by quantitative pyrohydrolysis.

R. A. H.

PAGE (J. O.) & GAINER (A. B.). *Determination of titanium and iron in titaniferous materials by cerate titrimetry*. Anal. Chem., 1959, **31**, 1399-1402.

After a potassium bisulphate fusion the titaniferous ore solution is titrated with cerium sulphate using methylene blue indicator for titanium and *N*-phenylanthranilic acid for iron: separate determinations are made for Cr and V. Results are given for the analyses of ilmenite ores.

R. A. H.

ROSS (W. J.) & WHITE (J. C.). *Extraction and determination of thorium from sulfate and phosphate solutions with tri-n-octylphosphine oxide*. Anal. Chem., 1959, **31**, 1847-1850, 3 figs.

In samples resulting from the leaching of monazite sands with H_2SO_4 , Th may be determined by a solvent extraction process. The method is specific for Th and requires about one-fourth of the time required in conventional procedures.

[M.A. 14-170]

R. A. H.

KORKISCH (J.) & FARAG (A.). *Beiträge zur analytischen Chemie des Zirkonioms. III. Eine neue Methode zur Anreicherung des Zirkonioms auf stark basischen Anionenaustauschern und deren Anwendung zur Bestimmung des Zirkonioms in Silicatgesteine*. Zeits. anal. Chemie, 1959, **166**, 170-180.

The determination of Zr in silicate rocks is described. Ti, Ca, Ba, Sr, and rare earth metals are previously separated. Zr is adsorbed on an anion-exchange resin from solution in 0.1 N H_2SO_4 and 0.5% NaF, and subsequently eluted with HCl. Zr is then determined volumetrically with EDTA, using solochrome violet R as indicator.

R. A. H.

INGAMELLS (C. O.). *Titrimetric determination of manganese following nitric acid oxidation in the presence of pyrophosphate*. Talanta, 1959, **2**, 171-175.

Divalent Mn is oxidized to Mn^{3+} and titrated with $(NH_4)_2SO_4 \cdot FeSO_4$ solution, using diphenylamine as indicator. Results for garnet, bauxite, Fe and Mn ores, and phosphate minerals agree well with those obtained by gravimetric and volumetric procedures. Modifications required for the preliminary attack on some of these minerals are discussed.

R. A. H.

LÓPEZ DE ASCONA (J. M.). *Nueva técnica de análisis espectral de disoluciones de minerales y productos metalúrgicos*. Notas y Comunicaciones Inst. Geol. Min. España, 1958, **52**, 109-115, 2 figs.

A new technique of spectral analysis of mineral solutions and metallurgical products consists in the continuous feeding of the lower electrode with the solution to be analyzed; the feeding can be carried out in different ways. The method of analysis has high sensitivity and gives results of great accuracy. No prior treatment of the solution to be employed is required.

M. F.-A.

BUZINCU (J.) & PETRESCU (M.). *Quantitative spectral analysis of germanium and indium in ores*. Rev. Met., Acad. R.P.R. [Roumanian Peoples Republic], 1958, **3**, 109-118.

R. A. H.

ROSSMANIETH (K.) & HANNA (Z. G.). [Spectrographic determination of trace elements in wolframite. Monats. Chem., 1959, **90**, 76-85.] Anal. Abstr., 1960, **7**, abstr. 1039.

Details are given of a spectrographic procedure for the determination of down to about 0.001% of Co, Ni, Cu, Sn, and Pb, with a mean error of 4 to 10%. Cr and Mo are also determined.

R. A. H.

MASLENNIKOV (B. M.) & ROMANOVA (L. V.). [Sensitometric quantitative spectrographic determination of lithium in ores and minerals. Trudy Gos. Nauch.-Issled. Inst. Gorno-khim. Syr'ya, 1958, 230-232.] Anal. Abstr., 1960, **7**, abstr. 361.

R. A. H.

KOSTYUKOVA (E. S.). [Spectrographic determination of hafnium in ores and minerals. Sb. Nauch. Trudy Irkutsk. Nauch. Inst., 1958, (7), 20-24.] Anal. Abstr., 1960, **7**, abstr. 78.

The temperature of a specially constructed carbon electrode is raised to 1100°-1200°C by the passage of an electric current before the arc is struck. This allows the evaporation to be accomplished with a far more uniform entry of the test substance into the arc than by evaporation without heating. For the determination of Hf a 1:1 sample:buffer ratio is used, the buffer mixture being equal parts of CaO and carbon powder with 4%U as U_3O_8 . For the range 0.01 to 3% Hf the lines Hf 2866.37, U 2870.94 and Zr 2905.22Å are used. [M.A. 13-509]

R. A. H.

Polarographic

BANERJEE (D. K.), BUDKE (C. C.), & MILLER (F. D.). *Polarographic determination of titanium in tantalum and niobium concentrates and ores*. Anal. Chem., 1959, **31**, 1836-1839.

A rapid polarographic method allows the determination of Ti in the range 0.1 to 5% in tantalum and niobium ores. No chemical separation is necessary. Ta, Nb, Fe, Sn, Mn and W do not interfere; Mo and V may do so but are not normally present.

R. A. H.

FLORENCE (T. M.). *A specific method for the determination of uranium in ores by cathode ray polarography*. Anal. Chim. Acta, 1959, **21**, 418-424, 2 figs.

The uranium is separated by a simple and rapid mercury cathode electrolysis and determined polarographically in a base electrolyte in which V, Ti, and W do not interfere. The results of the analysis of 10 standard uranium ores by this method are recorded.

R. A. H.

SA (I. M.), ISSA (R. M.), & HEWAIDY (I. F.). *Polarographic determination of iron and manganese in ores and metallurgical products*. Chemist Analyst, 1958, **47**, 88-90.

In the polarographic determination of Mn with triethanolamine, the use of Na_2SO_3 to remove dissolved O and excess of H_2O_2 (used as an oxidant) allows Fe and Mn to be determined in the same solution. R. A. H.

RŮŠA (J.) & SKOKAN (E.). [*Polarographic determination of chromium in ores*. Chem. Listy, 1958, **52**, 915-917.] Anal. Abstr., 1959, **6**, abstr. 898.

Chromates in solution with NaOH, NaCl, and phenylamino-diacetic acid yield a distinct polarographic wave suitable for the determination of Cr in the presence of all elements present in chromium ores. R. A. H.

DOLEŽAL (J.) & NOVÁK (J.). [*Rapid analytical methods for metals and minerals. V. Polarographic determination of copper and bismuth in minerals and in iron*. Chem. Listy, 1958, **52**, 36-39.] Anal. Abstr., 1958, **5**, abstr. 3270. R. A. H.

ȚĂNESCU (L.). [*Polarographic determination of titanium in alluvial sands*. Rev. Chim., Bucharest, 1958, **9**, 460-461.] Anal. Abstr., 1959, **6**, abstr. 2089. R. A. H.

WEISS (D.). [*Polarographic determination of tin in ores in the presence of lead*. Chem. Listy, 1958, **52**, 1817-1819.] Anal. Abstr., 1959, **6**, abstr. 2083.

Full details are given of a method suitable for the determination of 0.01 to 10% Sn in ores. R. A. H.

ZAREMBA (J.). [*Simultaneous polarographic determination of lead and zinc in sulphide ores*. Chem. Anal., Warsaw, 1958, **3**, 845-848.] Anal. Abstr., 1960, **7**, abstr. 434. R. A. H.

VENKATRATNAM (G.) & RAO (BH. S. V. RAGHAVA). *Polarography of beryllium*. Journ. Sci. Industr. Res. [India], 1958, **17B**, 360-362.

A polarographic method for estimating beryllium in a supporting electrolyte is described. A. P. S.

MIURA (Y.). [*Metallurgical polarographic analysis. VIII. Rapid determination of zinc in iron ores in the presence of nickel and cobalt*. Japan Analyst, 1959, **8**, 5-9.] Anal. Abstr., 1960, **7**, abstr. 47. R. A. H.

SULCEK (Z.), MICHAL (J.), & DOLEŽAL (J.). [*Rapid methods for the analysis of metals and crude minerals. VIII. The determination of small amounts of uranium in crude minerals*. Coll. Czech. Chem. Commun., 1959, **24**, 1815-1821.] Anal. Abstr., 1960, **7**, abstr. 1342.

The U is adsorbed on silica gel, eluted with conc. HCl, and determined polarographically. For a series of samples with 0.078 to 8.19% the error varied from -0.11 to +0.05%. R. A. H.

BIBLIOGRAPHIES AND BOOK NOTICES

CHARLESWORTH (J. K.). *Recent progress in Irish geology*. Irish Natur. Journ., 1959, **13**, 49-65.

Research on all aspects of Irish geology is summarized for the years 1950-58 and the bibliography of 350 titles brings up to date the earlier progress reports in this same journal, 1950, **10**, 61-71, and 1937, **6**, 265-273.

J. P.

VON HIPPEL (ARTHUR R.). *Molecular science and molecular engineering*. London (Chapman & Hall), New York (John Wiley & Sons), 1959, xv + 446 pp. Price 148s.

Reviewed M.M. **32**-501 by H.M.P.

STASIŃSKI (O.). *Elektronen- und Ionen-prozesse in Ionenkristallen. Mit Berücksichtigung Photochemischer Prozesse*. Berlin (Springer), 1959, viii + 307 pp., 107 figs. Price (bound) DM. 66.

Reviewed M.M. **32**-580 by H.M.P.

NORTHROP (STUART A.). *Minerals of New Mexico*. Revised [2nd] edition. Albuquerque (Univ. of New Mexico Press), 1959, 665 pp., map (approx. 16 miles to 1 inch). Price \$10.00.

Reviewed M.M. **32**-581 by J. M. Sweet.

VITANAGE (P. W.). *Geology of the country around Polonnaruwa (one-inch geological sheet 47, preliminary series)*. Mem. no. 1, Dept. of Mineralogy, Geol. Survey of Ceylon, 1959. Price Rs. 10.50.

Reviewed M.M. **32**-583, by G. H. Francis. [Dr. Francis met with a fatal accident when climbing in the Lake District, England, in June 1960. Ed.]

LAFITTE (PIERRE). *Introduction à l'étude des roches métamorphiques et des gîtes métallifères*. Paris (Masson), 1957, 343 pp. Price 44 N.F.

Intended for young geological specialists this book aims at giving the physico-chemical and thermodynamic data

necessary for the study of metamorphic rocks and of mineral deposits. Its four parts, comprising 13 chapters, are: I, General physico-chemical theory; II, Chemical composition of rocks; III, Thermodynamics; IV, Petrology of the metamorphic rocks.

E. J. & A. S.

JUNG (JEAN) & BROUSSE (ROBERT). *Classification modale des roches éruptives, utilisant les données fournies par le compteur de points*. Paris (Masson & Cie.), 1959, 122 pp., 5 figs. Price 1400 fr.

This work is divisible into 4 parts. I (pp. 11–24): history and theory of surface measurement and of continuous linear measurement to obtain the volumes of constituents; the method of F. Chayes; the principles of point counters. The standards of measurement necessary to reduce error to <1.4% and <2.45%, using thin sections of 320 mm² vary from 1000 to 9000 points, depending on the grain size of the rock. II (pp. 25–44): a modal classification is presented which is essentially the chemical mineralogical classification of A. Lacroix and which leads to a terminology closely similar to that classical one; and because of this similarity it is necessary to keep in mind the definitions of the new classification. III (pp. 45–61): a series of tables presenting the principal eruptive rock families and members. IV (pp. 62–122): an alphabetical index of 492 rock names; of these nearly 300 are defined on the basis of measured modes in terms of the authors' modal classification.

E. J. & A. S.

Reviewed M.M. 32–581 by S.E.E.

HESS (HARRY H.). *Stillwater igneous complex, Montana: A quantitative mineralogical study*. Geol. Soc. America, Mem. 80, 1960, 230 pp., 42 figs., 12 pls., 55 tables. Price \$5.50.

BALL (H. W.) & SCAIONI (E.). *Splendour in nature. Minerals and rocks*. London (Rathbone Books), 1959, 96 pp., 73 pls. (24 coloured). Price 25s.

SINCLAIR (W. E.). *Asbestos: its origin, production, and utilization*. 2nd edition. 1959, xxiv + 512 pp., 187 figs., 44 tables. Price £3 0s.

CHRISTOPHE-MICHEL-LÉVY (M.). *Tableaux des minéraux des roches: résumé de leurs propriétés optiques, cristallographiques et chimiques*. Paris (Editions du Centre Nat. de la Rech. Scientifique), 1960, 55 pp. Price 12 F.N.

Reviewed M.M. 32–584 by G. H. Francis.

SMALES (A. A.) & WAGER (L. R.), editors. *Methods in Geochemistry*. London (Interscience Publishers), 1960, vii + 464 pp., 103 figs. Price £4 14s.

R. A. H.

ROSE (A. J.), editor. *Repertoire de matériel cristallographique*. 2nd edition. Paris (The Apparatus Commission of the International Union of Crystallography), 1959, xxvi + 126 pp. Price fr. 12.50, \$2.50 (incl. postage).

Reviewed M.M. 32–501.

KASPER (J.), LONSDALE (K.), editors. *International tables for X-ray crystallography, volume 2*. Published for the International Union of Crystallography, Birmingham, England (Kynoch Press), 1959, xviii + 444 pp. with 39 figs., index and dictionary in five languages. Price (bound) £5 15s. inclusive of postage from the printer.

This is the second volume of the three planned for this very useful international publication, and it contains the mathematical tables required for X-ray diffraction studies. In addition there is a full presentation of the geometry of the crystal lattice, of the diffraction of X-rays, and of the necessary mathematical operations. This is not a textbook, but a reference work in which the printers have cooperated with the several authors and the two editors to produce a splendid volume. Individual crystallographers may obtain a copy for personal use at a reduced price on an application form obtainable through the appropriate scientific organisation. A sheet of errata for volume 1 is obtainable and also a sheet for volume 2 which contains some additional errata for volume 1.

N. F. M. H.

WILSON (A. J. C.), editor; section editors, BAENZIGER (N. C.), BARRETT (C. S.), BIJVOET (J. M.), ROBERTSON (J. MONTEITH), & WYART (J.). *Structure reports for 1952, volume 14*. Published for the International Union of Crystallography, Utrecht (A. Oosthoek), 1959, viii + 215 pp. Price (bound) 35 Dutch florins.

This gives supplementary material for the years 1948–1950. There is a cumulative index for metals and another one for all other compounds. Then there is a cumulative formula index, a cumulative author index, and cumulative corrigenda. This is a most valuable addition to the lengthening row of volumes in this series, and since volume 15 has been published, the gap is now filled [M.A. 13–54].

N. F. M. H.

WILSON (A. J. C.), editor; section editors, BAENZIGER (N. C.), WYART (J.), and ROBERTSON (J. MONTEITH). *Structure reports for 1952, volume 16*. Published for the International Union of Crystallography, Utrecht (A. Oosthoek), 1959, viii + 651 pp., numerous figs. Price (bound) 120 Dutch florins.

This great and indispensable work continues to appear as indeed it must from now onwards. The present volume

for the year 1952. As in previous volumes, the editing standard is very high, and it is to be hoped that resources will be available to enable the delay period of some six years to be reduced. The publication is now self-supporting, and the subsidy on which it was started after the war is now asked for.

N. F. M. H.

POLOKANOV (A. A.), editor] Полканов (А. А.), редактор. Методическое руководство по геологическому картированию метаморфических комплексов [*A methodic manual on the geological mapping of metamorphic complexes*]. Гос. Науч.-Техн. Изд. [State Sci.-Techn. Publ.], Moscow, 1957, 451 pp., 224 figs. Price 25 r. 10 k.

This book is written by a collective consisting of Nikolaev (A.), Gorlov (N. V.), Shurkin (K. A.), Sudovikov (N. G.), Slenikov (V. A.), and Priyatkina (L. A.). Its title is somewhat misleading, for it is not a manual on geological mapping, but a summary of recent results in the field of structural geology of metamorphic and igneous complexes. Though the book may be of much help to a field geologist, though the information provided is scattered and uneven. The absence of indexes is regrettable in a book of world-wide coverage, especially as it contains much valuable material relating to examples from the U.S.S.R. and interesting generalizations. The contents are: Ch. 1, Structural types and features of sedimentary and metamorphic rocks (pp. 7–119); Ch. 2, Stratigraphical subdivisions of the pre-Cambrian rocks (pp. 120–199); Ch. 3, Tectonics (pp. 200–304); Ch. 4, Magmatism (pp. 305–367);

Ch. 5, Metamorphism (pp. 368–439); Bibliography (pp. 440–448). S. I. T.

[BOBRIEVICH (A. P.), BONDARENKO (M. N.), GNEVUSHEV (M. A.), KRASOV (L. M.), SMIRNOV (G. I.), & YURKEVICH (R. K.), edited by SOBOLEV (V. S.)] Бобриевич (А. П.), Бондаренко (М. Н.), Гневушев (М. А.), Красов (Л. М.), Смирнов (Г. И.) и Юркевич (Р. К.), редактор Соболев (В. С.). Алмазные Месторождения Якутии [*Diamond deposits of Yakutiya*]. Гос. Научно-Техн. изд. лит. по геол. и охр. недр. [State sci.-techn. publ. lit. on geol. and prot. min. res.], Moscow, 1959, 527 pp., 333 figs. (including colour plates), size 10½ in. × 7½ in. × 1½ in., weight 4½ lb. Price 52 r. 30 k.

This is a highly amplified edition of the previous monograph on the Siberian diamonds [M.A. 14–40]. It is printed on a heavy glossy paper and it is illustrated by numerous coloured and uncoloured photographic reproductions, maps and sections. The book contains twenty-six chapters grouped into four parts. Part I (pp. 9–130), Geology of diamond deposits, including the historical review, general geology of the region, kimberlite pipes, and placer deposits: Part II, Petrography of kimberlites (pp. 133–270), including metamorphism and petrochemistry of kimberlites: Part III, Mineralogy of kimberlites (pp. 273–372): Part IV, Mineralogy of diamonds (pp. 375–514), including the form of crystals, sculpture of faces, morphological types, colour, luminescence, optical anisotropy, mechanical wear, and inclusions. At the end there is a short bibliographical list (pp. 515–525), but no index. [M.A. 14–122] S. I. T.

CLAY MINERALS

General : Techniques

BERTCHLY (A.) & STEADMAN (R.). *Summarized proceedings of a conference on X-ray analysis, Leeds, April 1959*. Journ. Appl. Phys. (Brit.), 1960, 11, 89–95.

Includes a short account of a review of the present state of knowledge of clay mineral structures (G. W. Brindley), summaries of papers on interstratified minerals (M. C. MacEwan), pseudomorphic transformations in the iron oxide and aluminium oxide systems (H. P. Rooksby), the surface structure of aluminosilicates (J. J. Fripiat), the iron-illite transformation (G. Brown and I. Stephen), the relationship between structural disorder, ionic substitution, and cation-exchange-capacity in some clays (E. Worrall & A. L. Roberts), the nature of the dehydration products of kaolinite (F. Vaughan), and the structure of sepiolite (W. J. Duffin & J. Goodyear). Discussions of these papers are also summarized.

J. M. H.

SCHAUFELBERGER (P.). *Die Bodenklassifikation in geologischer und petrographischer Betrachtungsweise*. Neues Jahrb. Geol. Paläont. Monatshefte, 1958, Heft 3/4, 155–171.

'Soil' is defined and a system for dividing soils into classes, orders, associations, types, subtypes, species, and subspecies on the basis of genesis and constitution is outlined. A. P.

FOSTER (M. D.). *The relation between 'illite', beidellite, and montmorillonite*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 386–397, 2 figs.

Formulas calculated from analyses written in the fractional notation of Ross and Hendricks [U.S. Geol. Survey Prof. Paper 205-B, 1945] show the relations between these minerals. 'Illites' have a much higher tetrahedral charge

than montmorillonites. Removal of fixed K and its replacement by exchangeable cations will not convert an 'illite' to a montmorillonite, or vice versa. From the standpoint of octahedral-tetrahedral charge relations beidellites and 'illites' resemble each other more closely than do montmorillonites and 'illites'. Structural formulas for calculated mixtures of kaolinite, 'illite', and montmorillonites show the charge relations and exchange capacity. Beidellite has a hypothetical composition most like the mineral that would be formed if K in 'illite' were removed and replaced by exchangeable Na or Ca. D. C.

ROSENQVIST (I. Th.). *Investigations in the clay-electrolyte-water system*. Publ. no. 9, Norwegian Geotech. Inst., Oslo, 1955, 125 pp., 46 figs.

A contribution to the petrology and mineralogy of clays, based on extensive experimental and theoretical work. The headings of the 11 chapters are as follows: Some fundamental conceptions—Mineralogical composition of Norwegian clays—External shape of the clay minerals—Orientation of clay minerals in marine clay deposits—Base exchange capacity—The electrolytic charge of the clay minerals—Sedimentation in water containing electrolyte—The salinity of Norwegian clays—The relation between mechanical properties and electrolyte content—Investigations into the physics of the water phase—A working hypothesis for the clay-electrolyte-water systems. Various experimental methods, some specially designed or adapted, have been applied. Some results may be quoted here. In Norwegian clays crushed rock-forming minerals usually predominate; clay minerals are relatively scarce and mostly belong to the group of hydrous micas (illite). They vary somewhat in composition, but their crystals are non-expanding and contain K in excess of 50% of the content in rock-forming mica. The transition mica \rightarrow illite is most probably due to a partial substitution of K^+ by H_3O^+ . Montmorillonite seems to be a rare mineral in Norwegian clays. Small quantities of kaolinite and bauxite minerals may be present. In some cases chlorite is important. Some of the clay minerals may possibly have crystallized after sedimentation. Using the electron microscope, applying oblique shadowing, it was found that clay mineral flakes may be as thin as 30 Å. The water in immediate contact with a clay mineral flake (3 or 4 molecular layers) must be considered belonging to the crystal rather than to the liquid, as its entropy conditions appear to be similar to those of ice. In undisturbed quick clay the orientation of the finest clay mineral flakes appears to be random. I. W. O.

ROY (R.). *The application of phase equilibrium data to certain aspects of clay mineralogy*. Proc. 2nd. Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 124-139, 2 figs.

The importance of recent work on the synthesis of minerals is demonstrated in the ability to prepare chemically pure, mineralogically homogeneous kaolinite, montmorillonites, micas, and chlorites. The stability of identification of the clay minerals are discussed in relation to some of the major problems of clay mineralogy. D. C.

MIELLENZ (R. C.), SCHIELTZ (N. C.), & KING (M.). *Thermogravimetric analysis of clay and clay minerals*. Proc. 2nd Conf. Clays and Clay Minerals, Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 285-314, 16 figs.

A thermogravimetric method using the Chevenard thermal balance is described. Curves for diasporite, goethite, dickite, serpentine, chrysotile, kaolinite, halloysite, biotite, lepidolite, talc, muscovite, pyrophyllite, chlorite, montmorillonite, hectorite, nontronite, celadonite, vermiculite, illite, vermiculite-chlorite, jefferisite, sepiolite and palygorskite are given and compared with those obtained for the same minerals by d.t.a. It is concluded that the Chevenard thermal balance is a reliable addition to methods used in the identification of clays and various other minerals. D. C.

BARSHAD (I.). *The use of salted pastes of soil colloids in X-ray analysis*. Proc. 2nd Conf. Clays and Clay Minerals, Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 209-217, 2 pls.

A new technique for the X-ray examination of clay minerals is described. The clay colloid is flocculated with NaCl, the 'free' Fe_2O_3 , Al_2O_3 , and SiO_2 are removed by various treatments, and the cleaned colloid is separated from the salted paste. The technique is based on the discovery that the interlayer swelling of montmorillonite persists in the presence of salt solutions, and that the 001 spacings become intensified in salted gels. D. C.

ORMSBY (W. C.) & SAND (L. B.). *Base exchange: an analytical tool for mixed-layer aggregates*. Proc. 2nd Conf. Clays and Clay Minerals, Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 254-263, 2 figs.

Determination of c.e.c. on 14 selected samples of montmorillonites, illites, and mixed-layer aggregates was made to test this method for identifying the clay minerals in samples of mixed materials. A good degree of precision was established for prepared artificial mixtures of illite and montmorillonite. D. C.

HATHAWAY (J. C.) & CARROLL (DOROTHY). *Distribution of clay minerals and ion-exchange capacity in some sedimentary materials*. Proc. 2nd Conf. Clays and Clay Minerals, Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 264-276, 6 figs.

The c.e.c. and mineralogy of 67 samples of various types unconsolidated sediments were determined. The probable quantitative clay composition of each sample was estimated, comparable degree of crystallinity for each clay mineral being assumed. A nomograph was made to give the mineralogical composition by weight from the basal peak a, d (001), values measured on X-ray diffractometer parts. Agreement was poor between the determined c.e.c. and that predicted from the clay mineral composition.

L. G. B.

MARSHALL (C. E.). *Multifunctional ionization as illustrated by the clay minerals*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 364-384, 10 figs.

The electrochemical properties of clay minerals are discussed under 4 rules that arise from consideration of bonding energies of ions associated with charged surfaces. The mean free bonding energy of a cation associated with a negatively charged surface is calculated from conventional potentiometric measurements with membrane electrodes. The first 3 rules deal with the effect of valency of ions upon ionization of monofunctional and polyfunctional surfaces. The 4th rule deals with mixtures of cations on polyfunctional surfaces. The application of these rules is illustrated by titration experiments using K, Na, Ca, Mg, and Ba with Wyoming and Arizona bentonites, Utah clay (montmorillonite with a little mica), illite, kaolinite, and attapulgite. Previous research in this field by Marshall and his co-workers is summarized.

D. C.

OMMER (A. M.) & CARROLL (D.). *Interpretation of potentiometric titration of H-montmorillonite*. Nature, 1960, **185**, 595-596.

The clay acid deviates in its behaviour from that of a pure weak dibasic acid. It obeys the type of generalized Henderson-Hasselbalch equation used in the titration of polyelectrolytes. Discontinuous titration data can be plotted so as to display clearly the exchange relations of cations in clays.

D. McK.

POODRUFF (C. M.). *The solubility of silica in hydrogen peroxide*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 120-123.

Filtrates from freshly prepared electrodialyzed clay contain amounts of silica that are directly related to the amount of exchangeable H in the clay. The silica in filtrates from untreated clay in concentrations of 1 to 64

parts of clay per 100 ml water range from 3 to 24 p.p.m. respectively.

D. C.

THOMAS (H. C.) & GAINES (G. L., Jr.). *The thermodynamics of ion exchange on clay minerals: a preliminary report on the system montmorillonite-Cs-Sr*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 398-403, 2 figs.

The advantages of the thermodynamic approach in the study of clay-ion-water systems are discussed. The principal theoretical and experimental problem is the determination of the initial slopes of the exchange isotherms. Figures are given for the exchange of Cs and Sr on Arizona montmorillonite. There are marked differences in the behaviour of univalent and divalent cations.

D. C.

GONZALEZ GARCÍA (S.). *Estudio comparativo de algunos métodos de investigación de arcillas en suelos*. An. Edaf. Fis. Veg., 1959, **18**, 723-743, 8 figs., 7 tables.

The compositions of clay fractions from four different soil-types are studied by several methods; exchange capacity, ethylene-glycol retention, and additivity of properties are examined. From determinations of exchange capacity, ethylene-glycol retention, and potassium content qualitative data on the components can be obtained, but quantitative information is possible only by X-ray analysis. The possibilities of infrared spectrography were studied by examining the spectra of the pure minerals, of mixtures of them, and of one of the soil clays. It is concluded that this technique can be used for qualitative diagnosis of the soil clays and for quantitative determination of kaolinite; the results agree with those obtained by other methods.

M. F.-A.

GUENNELON (R.). *Analyses des silicates d'alumine possibilités d'utilisation des complexones*. Ann. Agron., 1959, pp. 77-98.

Compleximetrically the analysis of solutions containing Fe and Al presents many difficulties, due to mutual interference and the slow rate of formation of the Al-complexes. A scheme of chemical analysis for clay minerals is proposed.

P. B.

SAND (L. B.) & ORMSBY (W. C.). *Evaluation of methods for quantitative analysis of halloysite-kaolinite clays*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 277-284, 2 figs.

Four methods, c.e.c., electron microscopy, thin section examination, and infra-red absorption, were used to identify the amounts of halloysite and kaolinite in artificial and natural mixtures.

D. C.

STONE (R. L.). *Preliminary study of the effects of water vapour pressure on thermograms of kaolinitic soils.* Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 315-323, 4 figs.

X-ray diffraction patterns and thermograms obtained by d.t.a. of 3 kaolinite-bearing soils from North Carolina are presented. The kaolinites from soils generally give poorer thermograms than commercial kaolins. Under dynamic steam atmospheres up to 90 lb/in² the endothermic peaks are sharpened and moved upwards, and the exothermic peak is made less intense and moved downward. This method promises to be of interest in theoretical studies of hydrates and hydroxides. D. C.

OSTHAUS (B. B.). *Chemical determination of tetrahedral ions in nontronite and montmorillonite.* Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 404-416, 5 figs.

Samples (0.5 g) of nontronite (Garfield, Washington) and montmorillonite (Polkville, Miss.) saturated with Na⁺ ions were digested with 100 ml 10% HCl on a steam bath for varying periods of time. The amounts of Fe, Al, and Mg in the filtrates are compared with the percentages of these constituents in the original minerals. Solubility curves for nontronite suggest the presence of both Fe and Al in the tetrahedral layer; those for montmorillonite indicate that there is no substitution for Si in the tetrahedral layer. Experimental values check closely with those calculated from complete analyses of the minerals. D. C.

JACKSON (M. L.), WHITTIG (L. D.), VANDEN HEUVEL (R. C.), KAUFMAN (A.), & BROWN (B. E.). *Some analyses of soil montmorin, vermiculite, mica, chlorite, and interstratified layer silicates.* Proc. 2nd Conf. Clays and Clay Minerals, Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 218-240, 7 figs.

Mineralogical analyses were made of 12 clay fractions and 1 silt fraction from 10 soil horizons and clay deposits. These clays illustrate a wide variety of analytical and interpretative problems. The analytical procedures used include X-ray diffraction (charts illustrate various treatments to identify the minerals), specific surface measurement, integral heating weight loss, and chemical analyses. Interpretation of interstratified clay minerals is discussed for a number of examples such as Fithian illite and High Bridge, Kentucky, metabentonite. D. C.

CHU (T. Y.), DAVIDSON (D. T.), & SHEELER (J. B.). *Mathematical analysis of a layer extraction method for separating clay-size material from soils.* Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 462-479, 10 figs.

A decantation method, in which the soil particles in definite layer are removed, is described for fairly large samples. The mathematical determination of particle size is based on the application of Stoke's law. D. C.

Structure ; properties, &c.

BYRNE (P. J. S.). *Some observations on montmorillonite organic complexes.* Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 241-251, 4 figs.

Fifteen samples of uncontaminated montmorillonite were treated with ethylene glycol, piperidine, and dodecylamine and examined by X-ray diffraction and d.t.a. The different samples of montmorillonite showed differences in the complexes formed that could not be correlated with exchangeable cations or chemical composition. In montmorillonites adjacent layers differ from one another in composition, structure, or some other factor. They appear to be intimate mixtures of several different kinds of unit sheets interleaved one with another. D. C.

SLABAUGH (W. H.) & KUPKA (F.). *Organic cation exchange properties of calcium montmorillonite.* Journ. Phys. Chem., 1958, **62**, 599-601, 2 figs.

W. T. H.

GREENE-KELLY (R.). *Birefringence of montmorillonite complexes.* Nature, 1959, **184**, 181.

Aromatic complexes in which the plane of the ring is perpendicular to the silicate layer have reduced negative birefringence, whereas complexes in which the ring is parallel to the layer are strongly negative. Changes in birefringence of aggregates on immersion in quinoline enables rapid assessment of clays for montmorillonite. Percentage of expanding layers can be evaluated in partially expanding homogeneous clays by change in birefringence with change in solvent. D. McK.

HAUSER (E. A.) & COLOMBO (U.). *Colloid science of montmorillonites and bentonites.* Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 439-461, 3 figs., 8 pls.

Chemical analyses of Wyoming bentonite and hectorite are compared with those of 3 different Ca-bentonites. The electrophoretic properties of bentonite are explained on the basis of the available counter ions. The formation of thixotropic bentonite gels is discussed in detail. The cation exchange of Na- and Ca-bentonites, and their differences, are explained on the basis of 2 different analytical procedures. Ultra- and electron-photomicrographic studies show differences between montmorillonites and the various types of bentonite. D. C.

DERSON (DUWAYNE M.) & LOW (PHILIP F.). *Density of water adsorbed on Wyoming bentonite*. *Nature*, 1957, **180**, 1194.

Water adsorbed on homoionic bentonites saturated with lithium, sodium, or potassium ions is less dense than the water. Details will be published later. C. H. K.

AN OLPHEN (H.). *Interlayer forces in bentonite*. *Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 418-437, 5 figs.*

A quantitative colloid chemical approach to the problem of the interlayer forces in montmorillonite is presented. The electric double-layer interaction, the van der Waals attraction, and the hydration energies are discussed. Montmorillonites are lyophobic colloids: the particles are crystalline and are protected by an electric double-layer. The long-range interaction results in a net interaction curve that is found as the sum of the double-layer repulsion and van der Waals attraction. The layers in montmorillonite do not spontaneously dissociate in solution. This indicates considerable specific adsorption of the exchangeable cations. These cations are either unhydrated and located at or close to the holes in the tetrahedral sheet, or completely hydrated and therefore adsorbed on top of the oxygen sheet. The net short-range potential curve for the layer interaction can be found from adsorption isotherms and X-ray diffraction. The potential energies of Ca- and Na-montmorillonites as functions of the amount of interlayer water are given in a graph. Ion hydration appears to be necessary to overcome the van der Waals attraction between layers in swelling clays. It is thought that the association-dissociation equilibrium of clay layers may be a special case of simultaneous flocculation and repeptization. D. C.

KOVALEV (G. A.) & DYAKONOV (YU. S.) [Ковалев (Г. А.) и Дьяконов (Ю. С.)]. Рентгеновское исследование глинистых минералов группы каолинита [*X-ray study of the kaolinite group of clay minerals*]. *Зап. Всесоюз. Мин. Общ.* [Mem. All-Union Min. Soc.], 1959, **88**, 467-473, 2 figs.

A number of clay minerals belonging to the kaolinite-alloysite series was studied by means of X-rays. It was found that this series is a continuous one varying from a well crystallised kaolinite to an imperfectly crystallised alloysite. This implies that there is no need to give separate names to the intermediate member of this series. This was done by G. W. Brindley and by A. L. Roberts & R. W. Grimshaw. S. I. T.

BRINDLEY (G. W.) & GILLERY (F. H.). *A mixed-layer kaolin-chlorite structure*. *Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 349-352, 1 fig.*

A chemical analysis and X-ray diffraction data are given for an iron-bearing chlorite ('daphnite') from Cornwall, England. The observed structure factors for chlorite and mixed kaolinite-chlorite are examined by one-dimensional Fourier analysis and it is found that the poor agreement between "observed" F values and those calculated for the normal chlorite-type structure is due to the distribution of the atoms in the Si-O hexagonal networks. D. C.

BRINDLEY (G. W.). *X-ray study of a new variety of serpentine (ortho-antigorite)*. *Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 354-356, 1 fig.*

Serpentine from Unst, Shetland Islands, Scotland, has an ortho-hexagonal cell with a 5.32, b 9.21, c 14.53 Å. The unit cell contains 2 structural layers arranged as in amesite. Evidence is presented for a superlattice parameter $S = 43.8$ Å which is consistent numerically with a super-spacing along either a or c . D. C.

BRADLEY (F. W.). *X-ray diffraction criteria for the characterization of chloritic material in sediments*. *Proc. 2nd Conf. Clays and Clay Minerals, Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 324-334, 5 figs.*

Methods for resolving mixtures of several kinds of clay minerals including chlorite, kaolinite, vermiculite, mica, and montmorillonite are given for diffraction charts obtained with a recording wide-angle X-ray spectrometer. The basal spacing, d (001), of the minerals is intensified, eliminated, or moved by heat and acid treatments, and by glycol expansion. Diffraction records of natural mixtures containing chlorite and kaolinite, and illite associated with other non-swelling and swelling clay minerals are presented and interpreted. D. C.

NELSON (B. W.) & ROY (R.). *New data on the composition and identification of chlorites*. *Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 335-346, 8 figs.*

Synthesis experiments on chlorite formation showed that there is a polymorphic relation between the 7 Å 'chlorites' (serpentine, greenalite, amesite, chamosite) and the 14 Å chlorites (penninite, clinocllore, prochlorite, corundophilite). Complete solid solution exists within each one of the series, and the 7 Å chlorites of appropriate composition that are polymorphs of normal (14 Å) chlorites may be converted into normal chlorites under appropriate conditions. Caution should be exercised in identifying chlorite-type minerals by heat treatment and X-ray diffraction. It is suggested that the 7 Å chlorites be referred to as 'septe-chlorites'. D. C.

FERRANDIA (V. ALEIXANDRE) & PASCUAL (M. C. RODRIGUEZ). *Influencia de los cationes de cambio sobre la cinética de las deshidratación de la haloisita*. An. Edaf. Fis. Veg., 1959, **18**, 677-691, 7 figs., 5 tables.

The influence of the exchange cations— Na^+ , K^+ , Mg^{2+} , and Ba^{2+} —and of temperature on the velocity of dehydration is examined at 6 different temperatures. The velocity parameter k is approx. the same for all four cations at each temperature, and at 542°C k is of the order $5.50 \times 10^{-4} \text{ sec}^{-1}$. When the test sample has lost about 6% of water the velocity of dehydration increases. Activation energies are less for halloysite than for montmorillonite whatever the cation; for homoionic halloysites the activation energies are of the order of 32.0 kcal/mol. [M.A. **14-17**].

M. F.-A.

BRINDLEY (G. W.) & NAKAHIRA (M.). *X-ray diffraction and gravimetric study of the dehydration reactions of gibbsite*. Zeits. Krist., 1959, **112**, 136-149, 8 figs.

The dehydration reactions under normal atmospheric conditions of a well crystallized gibbsite (partial analysis given) have been studied and quantitative verification obtained for the reactions: $140-200^\circ\text{C}$, $\alpha\text{-Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ (gibbsite) $\longrightarrow \alpha\text{-Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (boehmite) + H_2O ; $220-240^\circ\text{C}$, $\alpha\text{-Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O} \longrightarrow \chi\text{-Al}_2\text{O}_3 + 3\text{H}_2\text{O}$; 300°C ; $\alpha\text{-Al}_2\text{O}_3 \cdot \text{H}_2\text{O} \longrightarrow \gamma\text{-Al}_2\text{O}_3 (\text{aq}?) + \text{H}_2\text{O}$.

The nature of $\gamma\text{-Al}_2\text{O}_3$ is considered and new data are presented for long-range order in nearly anhydrous material.

R. A. H.

Petrological : weathering : various

KONTA (J.). *Studium jílových minerálů za konstantních pracovních podmínek v laboratoři* [Investigation of clay minerals under constant laboratory working conditions]. Silikáty, 1959, **3**, 239-246, 3 figs., 1 table.

It was observed how the weight of eleven powdered samples of kaolinite, illite, and montmorillonite rocks varied during the changes of temperature and humidity in the laboratory in course of several days. The author thinks that it would be useful if every newly published chemical analysis of clay mineral or clay rock were accompanied not only by the d.t.a. curve but also by the thermogravimetric curve.

J. N.

KONTA (J.). *O semikvantitativním mikroskopickém stanovení alitických a sialitických minerálů v bauxitových horninách* [Semi-quantitative microscopic determination of alitic and sialitic minerals in bauxite rocks]. Silikáty, 1958, **2**, 149-156, 2 figs., 4 tables.

M. Vendel's method of quantitative microscopic determination of two light, very finely dispersed minerals in

bauxite rocks was re-examined after the removal of an oxide pigment. Instead of 20% HCl, reduction by nascent hydrogen developing on the surface of an aluminium cylinder in warm 10% oxalic acid was used. Four samples of bauxite rocks from Czechoslovak localities were studied. Their chemical analyses are given. The mineral composition was ascertained by X-ray analysis, d.t.a., and the microscope in natural and treated samples. Values of refractive indices of de-ferrized residues determined by immersion method in sodium light give the bulk percentage of boehmite and kaolinite. Admixture of titanium and chromium causes a slight increase of the refractive index of the reduced residue. [M.M. **25-644**]

J. N.

ROSENQVIST (I. TH.). *Montmorillonite from Skyrvedalen, Hemsedal, S. Norway*. Norsk Geol. Tidsskr. 1959, **350-354**. (In Norwegian).

A highly plastic montmorillonite breccia rock from Skyrvedalen, Hemsedal, central Norway, has been investigated by means of X-ray and chemical methods. The rock is found to consist of a nearly hundred per cent calcic dioctahedral montmorillonite of extraordinary purity. Chemical analyses and X-ray data are given. K. S. H.

BROWN (G.) & STEPHEN (I.). *Expanding-lattice minerals from Shropshire*. Min. Mag., 1959, **32**, 251-253.

A preliminary note on the occurrence of two clay minerals in a brown earth near Woodgate, Shropshire. One is fibrous with a (fibre axis) 5.3 , b 9.2 , c 15.0\AA , β $96-98^\circ$, refr. ind. $1.56-1.57$, and bears some similarities to saponite; the other is a lamellar layer lattice silicate with similar dimensions, refr. ind. near 1.58 , $2V_x$ $15-30^\circ$, $a = \gamma$, $b = c = \alpha$. Both minerals are pseudomorphs which seem to have inherited considerable crystallographic order from their parent minerals.

J. Z.

SIAT (A.), WEY (R.), & WEIL (R.). *Identification d'argiles 'chlorite-montmorillonite' à interstratification régulière dans une roche filonienne des Vosges*. Bull. Soc. franç. Min. Crist., 1959, **82**, 402-403, 2 figs.

A clay occurring in joints in a vein of highly altered amygdaloidal basalt cutting the Cretes granite near Bagenelles has a 29.8\AA basal spacing: glycerol treatment increases this to 32.2\AA and calcination lowers it to 23\AA . It is considered to be a regularly interstratified chlorite (14.2\text{\AA})-montmorillonite (15.6\text{\AA}): its d.t.a. curve is figured. [M.M. **30-731**; M.A. **11-454**, **12-495**, **13-150**] R. A. H.

ALONZO (J. J.) & VIRGILI (C.). *Un nivel de arcillitas de la base de Trias estudiado en el microscopio electrónico*. An. Edaf. Fis. Veg., 1959, **18**, 1-9, 9 figs.

This soil from the base of the Catalan Trias is derived

in the subjacent Palaeozoic rocks. Examination shows that it corresponds to a soil of the Braunlehm type, partly denuded. M. F.-A.

NZALEZ PEÑA (J. M^a). *Composición y origen de la fracción arcilla de algunos sedimentos del litoral del Sahara español*. An Edaf. Fis. Veg., 1959, **18**, 137–154, 4 figs., 2 pls., 4 tables.

The mineralogy and derivation of the clay fraction in a series of sediments from the littoral of Río de Oro are studied. The clay minerals, examined by X-ray analysis of the powder and of oriented aggregates, d.t.a., and electron microscope, are mostly illitic for all samples from different depths, but minor amounts of kaolinite, chlorite, and perhaps also glauconite are present. Diagenetic changes in the clay are probable. M. F.-A.

ФЕДОРЧУК (V. P.) Федорчук (B. П.). О генезисе глинистых минералов в ртутно-сурьмяных месторождениях южной Ферганы [*Origin of clay minerals in mercury-antimony deposits of south Fergana*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 693–699, 2 figs.

This is a detailed chemical, thermal, and X-ray study of country rocks (Palaeozoic shales) and clay minerals extracted from them and from a mercury-antimony sulphide deposit of hydrothermal origin. Twenty-one chemical analyses of unaltered and bleached shales and eight analyses of extracted clay minerals are given. It is suggested that sericite was the primary mineral and that the main hydrothermal changes were sericite → hydromica → kaolinite. S. I. T.

ONOSO (L.). *Premier examen de la fraction argileuse de quelques sols du Chili*. Bull. Soc. franç. Min. Crist., 1959, **82**, 361–363.

A red desert soil and a granular soil from peridesert conditions, both formed on sediments derived from granite and basalt, contain illite and montmorillonite. A soil formed in a humid climate on volcanic debris contains illite and vermiculite associated with colloidal hydroxides. Chemical analyses are given for the three soils. R. A. H.

ILLÈRE (S.). *Étude minéralogique de quelques matériaux glaciaires de l'archipel de Kerguelen*. Bull. Soc. franç. Min. Crist., 1959, **82**, 404.

D.t.a. runs on glacial materials show montmorillonite and chlorite in several specimens with one example of a pure kaolinite. R. A. H.

CONNELL (D.). *An American occurrence of volkonskoite*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, Publ. 327, 1954, 152–157, 1 fig.

A partial chemical analysis and X-ray diffraction data

are given for a green clay mineral in the Morrison sandstone (upper Jurassic) near Thompson's, Utah. The mineral contains 1.67% Cr₂O₃ and has been identified as volkonskoite. D. C.

SWINEFORD (ADA), MCNEAL (J. D.), & CRUMPTON (C. F.). *Hydrated halloysite in Blue Hill shale*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 158–170, 5 figs.

Hydrated halloysite occurs with alunite in the upper part of the Blue Hill shale (upper Cretaceous) at 3 localities in west-central Kansas. X-ray diffraction, d.t.a., electron micrographs, and a chemical analysis are given. The halloysite appears to replace alunite and to form from shale at alunite/shale contacts. Pyrite is present in the overlying sandstone and in the shale. The halloysite occurs mainly in the vicinity of calcareous concretions. D. C.

CARROLL (DOROTHY) & HATHAWAY (J. C.). *Clay minerals in a limestone soil profile*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 171–182, 1 fig.

Kaolinite and chlorite occur in a soil developed from Lenoir limestone (Ordovician) in Augusta County, Virginia. The limestone contains a micaceous clay mineral that is altered during soil formation of podsollic character to kaolinite and chlorite. Partial chemical analyses of the whole soil and of the clay fractions are given together with pH and c.e.c. values. X-ray diffraction patterns show the gradual changes in composition of the clay fraction through 13 feet of residuum and soil. D. C.

WILLIAMS (F. J.), ELSLEY (B. C.), & WEINTRITT (D. J.). *The variations of Wyoming bentonite as a function of the overburden*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 141–151, 7 figs.

The colloidal properties and cation exchange characteristics of 5 similar deposits of bentonite in northeastern Wyoming are described. The deposits include those at Upton, Clay Spur, and Osage which are commercially important and have been used as standards by the American Petroleum Institute. Highest grade bentonite is yellow; a blue color indicates inferior commercial quality. The primary cause for variation in properties is due to the Na/Ca ratios in the exchange positions. Impurities in the bentonites are gypsum, biotite, feldspar, cristobalite, volcanic shards, and quartz (10–15%). Exchangeable Na is 20–65 me. and Ca+Mg is 35–65 me./100 g. D. C.

DAVIDSON (D. T.) & HANDY (R. L.). *Studies of clay fractions of southwestern Iowa loess*. Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 190–208, 15 figs.

The clay-sized material in loess of Wisconsin age was studied by mechanical analysis, d.t.a., c.e.c., refr. ind., and X-ray diffraction. Montmorillonite and illite are the predominating clay minerals. The c.e.c. ranges from 52 to 63 me./110 g. Ca and Mg are the principal exchangeable cations. The pH varies from 6.7 to 8.3 with the CaCO_3 -content for 4 selected samples. Photomicrographs show the appearance of clay coatings on larger mineral particles. The relation between clay content and the plastic limit of the loess is evaluated and discussed. D. C.

DEJOU (J.). *Étude comparative des phénomènes d'altération sur granite porphyroïde de Lormes et sur anatexites à cordiérite du Morvan-Nord et des sols qui en dérivent.* Ann. Agron., 1959, pp. 101-123.

Under the prevailing conditions the monzonitic granite of Lormes shows marked physical weathering to a deep (2-7 metres) sandy C horizon, and chemical weathering predominantly of plagioclase to kaolinite. The metamorphic anatexite shows only slight physical weathering, and more marked chemical weathering than the granite, in which cordierite and plagioclase give rise to illite and kaolinite. P. B.

BIROT (P.), CAILLÈRE (S.), & HÉNIN (S.). *Étude du problème des premiers stades de l'altération de quelques roches.* Ann. Agron., 1959, pp. 257-265.

Laboratory experiments and analyses of field samples confirm that the first stages of disintegration of basic and, less frequently, acidic rocks are accompanied by the formation of clay minerals of montmorillonite-saponite type. The latter may break down subsequently to give rise to kaolinite or sesquioxides. P. B.

GRAHAM (E. R.). *Weathering according to the cationic bonding energies of colloids.* Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 492-498.

The total energy change associated with pH, total H, and bonding energy involved in the weathering of natural phosphates was examined by mixing particles of apatite

with H-Amberlite (I.R. 120), H-bentonite, H-Putnam and H-kaolinite, and H-humus. Mixtures of K- and Na-bentonites and powdered rock phosphate were also investigated. The amount of P removed was related to bonding at the outset, and to Ca-bonding energy of clays. H-Amberlite was the most effective, and H-humus was the least effective weathering agent. The clays were effective in the order:— kaolinite < Putnam clay < bentonite. K- and Na-bentonites were effective as phosphate mineral weathering agents. D. C.

ROLFE (B. N.). *Mineralogy of soil profiles: Iredell and Durham soils from the Piedmont province of North Carolina.* Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 183-189.

A comparative study of soils derived from biotite granite and from meta-gabbro was made. The clay fraction of the granitic soil (Durham) consists of a kaolinite-halloysite intermediate, mica, and quartz. The clay fraction of the meta-gabbro soil (Iredell) consists of chlorite, montmorillonite, vermiculite, interlayered talc-like minerals, and quartz. D. C.

WOUDT (B. D. VAN'T). *Particle coatings affecting the wettability of soils.* Journ. Geophys. Res., 1959, 64, 263-267, 1 table.

Theory of wetting of soils is discussed and some experiments are described which indicate that the angle of contact does not change as the soil wets or dries out. Particle coatings can increase water repellancy in soils but the nature of the coatings has not been quantitatively related to the degree of unwettability. F. R. H.

BUESSEM (W. R.) & NAGY (B.). *The mechanism of clay deformation.* Proc. 2nd Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Washington, 1954, Publ. 327, 480-491, 7 figs.

Compression of clay-water mixtures in the workable state produces two irreversible changes: (1) increase in rigidity (strength); (2) orientation of the clay particles relative to the direction of compressive stress. D. C.

CRYSTAL STRUCTURE OF MINERALS

PATTERSON (A. L.). *Function spaces between crystal space and Fourier-transform space.* Zeits. Krist., 1959, **112**, 22-32.

A general expression is given in terms of Hermite functions for the kernels of integral transforms. This leads to sets of function spaces lying between any given function space and its Fourier-transform space in one dimension.

The problem of extension to two and three dimensions is considered and the problem of geometrical frameworks for such transforms is discussed. R. A. H.

BEEVERS (C. A.) & EHRLICH (H. W.). *The interpretation of the Patterson synthesis in X-ray crystallography.* Zeits. Krist., 1959, **112**, 414-426, 9 figs. R. A. H.

POVARENNYKH (A. S.) [Поваренных (А. С.): Некоторые вопросы теории координационного числа атомов в кристаллах [On the theory of the coordination number of atoms in crystals]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 395-407, 2 figs.

A detailed survey, supported by tables and diagrams, reveals that the coordination number of a given atom in a crystal depends on the nature of the bond linking it to neighbouring atoms, the ratio of valencies, presence of radicals or complex anions with large cavities, presence of certain atoms outside the sphere of immediate neighbourhood, and temperature and pressure. S. I. T.

MATHIESON (A. McL.), RADOSLOVICH (E. W.), & WALKER (G. F.). *Accuracy in structure analysis of layer silicates*. Acta Cryst., 1959, **12**, 937-938, 1 fig.

A reminder that the interpretation of minor details of structure determinations is often not justified by the accuracy and number of X-ray intensity measurements made. The point is illustrated by criticism of a layer silicate structure analysis [M.A. 14-25]. J. Z.

BERNAL (J. D.). *Order and disorder and their expression in diffraction*. Zeits. Krist., 1959, **112**, 4-21.

Von Laue's conception of the diffraction of ideal, extended crystals of regular structure is extended systematically to states of matter with every degree of irregular structure. In crystals the diffraction effects of a variety of imperfections due to small size, heat, deformation, twinning, substitutions are distinguished. In fibrous and liquid crystals a certain number of the intermediate classes of intermediate structures [Zeits. Krist., 1932, **81**, 317] are described. The classification is based on various combinations of dimensional linking according to the principles of Weissenberg. In liquids the theory of intrinsic irregularity of coherent molecules of finite volume is shown to represent a structure ordered only statistically. R. A. H.

MONNAY (G.), WYART (J.), & SABATIER (G.). *Structural mechanism of thermal and compositional transformations in silicates*. Zeits. Krist., 1959, **112**, 161-168.

A thermal transformation is either displacive or reconstructive, but a compositional transformation is always reconstructive. Any silicate transformation can result from either or both of the following causes: (1) changes in the sizes of the cations outside the tetrahedra and in the ratios of their effective radii; this mechanism can operate in the solid state; (2) changes in the Si-Al distribution due to the Si-Al mobility in the solid state; a mechanism is proposed with water as essential catalyst, tetrahedra being opened and closed by diffusing protons and hydroxyl ions.

R. A. H.

McLACHLAN (DAN, Jr.). *The extension of certain methods of sign determination*. Zeits. Krist., 1959, **112**, 108-125, 4 figs.

Some known methods of phase determination are discussed and compared and the principle that certain operations applied to separate atoms give the same result as operations on the entire structure is presented. This principle is applied and a probability procedure is developed and illustrated graphically. R. A. H.

WALKER (P. L., Jr.) & IMPERIAL (GEORGE). *Graphitic character of kish*. Nature, 1957, **180**, 1185.

The carbon in raw kish is subject to internal pressure and the interlayer spacing is therefore lower than that of Ceylon natural graphite. With removal of the iron present in kish the interlayer spacing increases to that of natural graphite. In the formation of Ceylon graphite the pressure necessary to produce good ordering and large crystallites and hence a small interlayer spacing could be produced by the depth of the deposit. C. H. K.

WALKER (P. L., Jr.) & IMPERIAL (GEORGE). *Interlayer spacings of graphitic carbons*. Nature, 1957, **180**, 1184-1185.

Interlayer spacings of commercial graphitized carbons heated to 3600°C are higher than those of Ceylon natural graphite because the porosity developed previously during the coking cycle prevents crystallite growth. C. H. K.

HOLM (C. H.), ADAMS (C. R.), & IBERS (J. A.). *The hydrogen bond in boehmite*. Journ. Phys. Chem., 1958, **62**, 992-994.

Nuclear magnetic resonance measurements on synthetic boehmite show the O-H-O bond to be asymmetric.

W. T. H.

LAPHAM (DAVIS M.). *An inequilibrium modification of the corundum structure*. Amer. Min., 1959, **44**, 670-672.

It is claimed that a new modification of the corundum structure, designated μ , has been detected by X-ray diffraction in several aluminous materials after differential thermal analysis which showed an endotherm at 1050°C. A. P.

FLORKE (O. W.). *Regelungserscheinungen bei der paramorphen Umwandlung von SiO₂-Kristallen*. Zeits. Krist., 1959, **112**, 126-135, 6 figs.

It is considered unlikely that melanophlogite from Girgenti, Sicily, is a paramorph of quartz after cristobalite [M.A. 7-234]. The related orientation in quartz paramorphs after cristobalite was investigated for the specimens from Ellora caves, India [M.A. 10-188], and in those after

tridymite in material from Monte Grotto, Euganean Hills, Italy, and from Colorado [M.A. 10-384]. In all these cases the quartz is in definite orientation with respect to the lattice of the primary crystals; it is assumed that these related orientations are important in the formation of microcrystalline quartz showing preferred orientation such as chalcedony [M.A. 7-514].

R. A. H.

HARTMAN (P.). *La morphologie structurale du quartz*. Bull. Soc. franç. Min. Crist., 1959, **82**, 335-340, 6 figs.

Three important zones are recognized parallel to chains of strong bonding—[0001], [01 $\bar{1}$ 1], and [10 $\bar{1}$ 0]. The majority of the forms reported for quartz occur in these three zones. The absence of the basal plane can be explained on the hypothesis that the growth units are SiO₂ or Si₂O₄ molecules.

R. A. H.

ZOLTAI (T.) & BUERGER (M. J.). *The crystal structure of coesite, the dense, high-pressure form of silica*. Zeits. Krist., 1959, **111**, 129-141, 9 figs.

Coesite, prepared by heating a charge of dry sodium metasilicate and diammonium phosphate at 700°C and 40,000 atmospheres for 16 hours, is monoclinic, a 7.17, b 7.17, c 12.38Å, γ 120.0°, space group $B2/b$, $Z = 16$. Si is tetrahedrally surrounded by four oxygen atoms and the structure is a new tetrahedral framework. There is a certain resemblance between the coesite structure and the alumina-silica network in feldspar. [M.A. 12-409, 410, 13-485]

R. A. H.

DACHILLE (F.) & ROY (R.). *High-pressure region of the silica isotypes*. Zeits. Krist., 1959, **111**, 451-461, 3 figs.

The equilibrium relations for the various polymorphs of SiO₂, and for several silica isotypes such as AlPO₄ and FeAsO₄, have been determined up to approximately 600°C and 60,000 bars. Reproducibility, reversibility, and ease of attainment of equilibrium have been explored for the apparatus concerned, using the quartz-coesite reaction. At 500°C SiO₂ transforms to coesite at 20,400 bars. Tridymite and cristobalite cannot be transformed metastably into other new high-pressure forms. The cell parameters of coesite have been accurately re-determined [values not given], and in conjunction with a new determination of the sp. gr. as 2.93, these give $Z = 16$. [M.A. 13-485 and preceding abstract]

R. A. H.

SHROPSHIRE (J.), KEAT (P. P.), & VAUGHAN (P. A.). *The crystal structure of keatite, a new form of silica*. Zeits. Krist., 1959, **112**, 409-413, 3 figs.

Keatite was obtained under wide ranges of temperature (380°-585°C) and pressure (5,000-18,000 lb/in²) but the

concentration of the various bases used (Li₂CO₃, Na₂CO₃, LiOH, NaOH, KOH, Na₂WO₄) was critical, cristobalite quartz being obtained if the base concentration was high or too low respectively. Keatite is tetragonal, sp. group $P4_21$ (or $P4_32_1$), a 7.46, c 8.61Å, $Z = 12$. The structure contains four-fold spirals of SiO₄ tetrahedra which share corners. These spirals are linked by additional tetrahedra, each of which shares its corners with tetrahedra in four different spirals.

R. A. H.

WEYL (R.). *Präzisionsbestimmung der Kristallstruktur von Brookites, TiO₂*. Zeit. Krist., 1959, **111**, 401-409, 9 figs.

Recalculations of the atomic distances in brookite show that the central Ti atom in a TiO₆ octahedron is displaced by 0.2 ± 0.1 Å from the centre, and that this atom is further away by 0.12 ± 0.06 Å from two neighbouring atoms in the octahedral chain than from the third neighbouring atom.

R. A. H.

GREENWALD (S.), PICKART (S. J.), & GRANNIS (F. I.). *Cation distribution and g factors of certain spinels containing Ni⁺⁺, Mn⁺⁺, Co⁺⁺, Al⁺⁺⁺, Ga⁺⁺⁺, and Fe⁺⁺⁺*. Journ. Chem. Physics, 1954, **22**, 1597-1606, 6 figs.

X-ray measurements on synthetic NiO.Al₂O₃, MnO.Al₂O₃, and CoO.Al₂O₃ show that the Ni spinel has an almost completely inverted structure, the Mn spinel is partially inverted, and the Co compound has the structure of an almost completely normal spinel.

R. A. H.

GOODENOUGH (J. B.) & LOEB (A. L.). *Theory of ionic ordering, crystal distortion, and magnetic exchange due to covalent forces in spinels*. Phys. Rev., 1955, **97**, 391-408, 6 figs.

Elastic- and electrostatic-energy considerations are insufficient to explain cation ordering between tetrahedral and octahedral sites in spinels. Tetrahedral, octahedral, and square covalent bonds are also important when cations are to be accommodated in these sites. A new magnetic exchange mechanism, 'semicovalent exchange', which is consistent with the covalent model is used to explain the magnetic properties of spinels.

R. A. H.

AZÁROFF (L. V.). *Formation, structure, and bonding of Ni-Co-Mn oxides having spinel-type structure*. Zeits. Krist., 1959, **112**, 33-43, 2 figs.

From a neutron-diffraction study of the structures of nine synthetic manganites containing different amounts of Ni and Co, it is concluded that Ni atoms occupy octahedral sites and Co atoms occupy tetrahedral sites in the spinel-type structure. A model is proposed in which Ni²⁺ is ionically bonded, Co²⁺ is ionically bonded but may form covalent bonds via its dsp^2 or sp^3 orbitals. Mn³⁺ is believed

form covalent bonds via admixed dsp^2 and d^2sp^3 orbitals, and Mn^{2+} is predominantly ionically bonded. The substitution of Ni^{2+} in octahedral sites also causes the formation of an equal number of Mn^{4+} ions. This model is consistent with the tetragonal symmetry of $(Co, Mn)Mn_2O_4$ and the cubic symmetry of Ni-containing compounds. R. A. H.

NGAW (H. D.). *Order and disorder in the feldspars, I.* Min. Mag., 1959, **32**, 226–241, 5 figs.

Three types of disorder are clearly defined and discussed with reference to the feldspars, viz., substitution disorder, cation disorder, and stacking disorder. It is shown that these are related since substitution of one cation by another will tend to produce regions of local order different from the order of the host; one sub-cell may accommodate the substituted cation more easily than another and a stacking fault will occur. The extra reflections which occur in plagioclase of intermediate composition, described here as interference reflections, are considered to result from systematic stacking faults. The difference between orthoclase and microcline is discussed in terms of stacking disorder. W. S. M.

DOWN (M. G.) & GAY (P.). *The reciprocal lattice geometry of the plagioclase feldspar structures.* Zeits. Krist., 1958, **111**, 1–14, 4 figs.

The characteristics of the various structural phases recognised over the plagioclase series are described, together with a general account of their probable composition fields and the manner in which the transitions between structure types take place. Throughout the transitions between the variety of forms, more or less well defined in character, the essential feldspar silicate framework remains unchanged. The reciprocal lattice characteristic of each structure type is illustrated. The general scheme of structural changes can only be resolved when the key structures have been determined with precision. R. A. H.

BRUEH (A. J., Jr.). *The structure of hessite, Ag_2Te -III.* Zeits. Krist., 1959, **112**, 44–52, 3 figs.

The space group of a single crystal of hessite (Ag_2Te -III β - Ag_2Te , the polymorph stable from room temperatures up to 105°–145°C) from Bótes, Transylvania, was found to be monoclinic $P2_1/c$, with a 8.09, b 4.48, c 8.96 Å, β 123°20'; $Z = 4$. All atoms lie on the fourfold general positions: one type of Ag atom is surrounded by 4 Te atoms making a somewhat distorted tetrahedron with average Ag–Te distance 2.95 Å; the other type of Ag atom has 5 close Te neighbours at the same average distance. This cell and the symmetry differ from those previously reported [M.A. 11–9]: it is believed that other determinations have been based on data from twinned crystals. [M.A. 5–175, 310, 396] R. A. H.

EVANS (H. T.) & MCKNIGHT (E. T.). *New wurtzite polytypes from Joplin, Missouri.* Amer. Min., 1959, **44**, 1210–1218, 3 figs., 3 tables.

Hemimorphic, hexagonal wurtzite (ZnS) crystals up to 2 mm long occur on botryoidal blende from the Zig Zag Mine, Joplin, Missouri, U.S.A., and have been studied by crystallographic and X-ray techniques. The space group is $P6_3mc$ with a 3.824 ± 0.004 , c 31.20 ± 0.03 Å; there are 10 ZnS per unit cell. Buerger precession photographs of the ($h0l$) net indicated a new wurtzite-10H polytype with a stacking sequence of 55. Powder diffraction data indicated the presence of a wurtzite-8H polytype with space group $P6_3mc$, a 3.82 ± 0.01 , c 24.96 ± 0.08 Å, $Z = 8$. Wurtzite-6H was also found at the Zig Zag Mine. These polytypes evidently form a homologous series: 2H, 4H, 6H, 8H, 10H, resulting from growth phenomena based on screw dislocations. [M.A. 14–279] B. H. B.

[GODOVIKOV (A. A.)] Годовиков (А. А.). О зависимости параметра решетки минералов группы скаттерудита от химического состава [On the relation of lattice parameters of minerals of the skutterudite group to their chemical composition]. Труды Минер. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 57–73, 1 fig.

This is a continuation of the work of R. J. Holmes [M.A. 10–204] on the arsenides of Co, Ni, and Fe. Three mineral species are distinguished: (1) skutterudite, a non-zonal cobalt arsenide which may contain Ni and Fe up to 30% of the total metallic atoms, (2) chloanthite, a non-zonal nickel arsenide which may contain up to 20% Co, (3) smaltite, a zonal isomorphous mixture of skutterudite and chloanthite containing between 30 and 80% Ni and Fe of the total metallic atoms. On the basis of chemical and X-ray data a relation between chemical composition, on the one hand, and cell parameters and specific gravity, on the other, is traced. S. I. T.

TOUSSAINT (J.) & BRASSEUR (H.). *Sur la structure de quelques composés uranifères hydratés.* Bull. Acad. roy. Belgique, Cl. Sci., 5^e sér., 1959, **45**, 501–506, 2 figs.

Billietite, becquerelite, schoepite, wölsendorfite, fourmarierite, and vandendriesscheite have the uranium atoms placed at the intersections of a simple pseudo-hexagonal lattice the spacing of which varies very little from one mineral to the other. The mean dimensions are 4.1 Å (side of the hexagon) and 7.4 Å (height of the prism). The structure of these compounds is based on the existence of plane sheets of composition $UO_2(O,OH)_2$. J. M.

ALM (K.-F.). *The crystal structure of barytocalcite $BaCa(CO_3)_2$.* Arkiv Min. Geol. Stockholm, 1958, **2**, 399–410.

By equi-inclination Weissenberg photographs and Fourier syntheses on (010) and (001) the space group of baryto-calcite, $\text{BaCa}(\text{CO}_3)_2$ is shown to be $C_2^2-P2_1$. The unit cell contains two molecules and its dimensions are a 8.15, b 5.22, c 6.58 Å with β 106°8'. The structure is described and its relation to some other structures discussed. K. F.

KUNZE (G.). *Fehlorderungen des Antigorits*. Zeits. Krist., 1959, **111**, 190–212, 7 figs.

X-ray Weissenberg photographs of antigorite show that hkl reflections with $k \neq 3n$ (n =integer), are drawn out into streaks while other reflections are sharp spots. The intensity distribution can be explained by faulty packing of the undulating antigorite sheets. Analysis of the structural disorder shows that the undulating sheets are continuous and do not take the form of strips parallel to the axis of curvature. An alternative structure to that presented previously [Zeits. Krist., 1956, **108**, 82] is discussed.

J. Z.

UEDA (TATEO) & NISHIMURA (SHIN'ICHI). *A consideration of the crystal structure of yttrialite*. Journ. Geol. Soc. Japan, 1954, **60**, 131–137. (In English with Japanese summary.)

New chemical analyses are reported for two yttrialites from pegmatites at Komenono, Ehime Prefecture and Suishoyama, Fukushima Prefecture, sp. gr. 4.022 and 4.235, respectively. Both specimens are scandium free and are essentially $\text{Y}_2\text{Si}_2\text{O}_7$. X-ray powder diffraction patterns show but 7 and 3 lines respectively. These can be indexed on the basis of a thortveitite cell. Assuming the same space group, $C2/m$, and parameters as for thortveitite, intensity calculations show that the numerous missing reflections correspond to those for which a very low intensity is expected. It is concluded that yttrialite is isostructural with thortveitite. Cell dimensions are not given. A. P.

SUNDIUS (NILS). *The rhombic amphibole holmquistite*. Amer. Min., 1959, **44**, 669–670.

Commenting on the work of Vogt, Bastiansen, and Skancke [M.A. 14–178] it is stated that it seems most correct to designate holmquistite as a lithium gedrite. A. P.

LYON (R. J. P.) & TUDDENHAM (W. M.). *Determination of tetrahedral aluminium in mica by infra-red absorption analysis*. Nature, 1960, **185**, 374–375.

Infrared absorption curves between 8.5 and 11 μ for 22 analyzed natural and synthetic micas show that the shape of the 9–10 μ region is dependent only on the amount of tetrahedral aluminium, whereas the wavelength of the maxima increases with increasing atomic weight of the

dominant octahedral ion and varies in lepidolite, muscovite, phlogopite, and biotite. The aluminium content distribution in a mica can therefore be estimated by a physical method. Absorption spectra become simplified as the number of tetrahedral aluminium atoms (Y number) approaches 1; talc and pyrophyllite, however, with $Y=2$ have simple spectra, and margarite with $Y=3$ has a complex pattern.

D. McI.

STAPLES (L. W.) & GARD (J. A.). *The fibrous zeolite erionite: its occurrence, unit cell, and structure*. Mineralogical Magazine, 1959, **32**, 261–281, 10 figs.

The type locality for erionite [Eakle, 1898, Amer. Jour. Sci., ser. 4, **6**, 66] has been identified as the old Durkee mine, Swayze Creek, Baker Co., Oregon, where this zeolite occurs in seams in rhyolitic tuff. The X-ray pattern could all be indexed on an orthorhombic lattice. Single crystal electron diffraction studies showed that the unit cell is hexagonal, a 13.26, c 15.12 Å, space group $P3_1c$, $P3_2c$, $P6_3mc$, $P6_2c$, or $P6_3/mmc$; sp. gr. $P6_3/mmc$ (2.07 calc.). Chemical analysis by L. L. Hoagland gave SiO_2 57.40, Al_2O_3 15.60, CaO 2.92, MgO 1.11, K_2O 3.35, Na_2O 1.45, H_2O 17.58, =99.46, leading to idealized contents $(\text{Ca}, \text{Mg}, \text{Na}_2, \text{K}_2)_{4.5} \text{Al}_9 \text{Si}_{27} \text{O}_{72} \cdot 27 \text{H}_2\text{O}$. A d.t.a. endothermic peak is obtained at 235–245°C and a sharp break occurs at 920°C. A structure is proposed for the aluminosilicate frame, with space group $P6_3/mmc$, which gives satisfactory agreement between observed and calculated structure factors for the X-ray fibre rotation patterns [M.M. 32–343; M.A. 14–55; A.M. 44–501] R. A. H.

TAKEUCHI (Y.) & SADANAGA (R.). *The crystal structure of xanthophyllite*. Acta Cryst., 1959, **12**, 945–946, 1 fig.

Xanthophyllite with formula $\text{Ca}_{1.10} \text{Mg}_{2.18} \text{Al}_{10} (\text{Al}_{2.95} \text{Si}_{1.05}) \text{O}_{10} (\text{OH})_2$ has cell parameters a 5.19, b 9.1, c 9.74 Å, β 100.1°, space group $C2/m$, $Z=2$; D meas. 3.3 gm/cm³. Electron density projections along x and y show that the deformed (Al,Si)–O sheets have trigonal symmetry, and it is suggested that while the tetrahedral sites are occupied randomly by Al and Si, the octahedral sites are occupied randomly by Mg and Al. Further refinement of the structure is to be reported later. [M.A. 8–15, 11–4] J. Z.

GELLER (S.) & MITCHELL (D. W.). *Rare earth ion radii in the iron garnets*. Acta Cryst., 1959, **12**, 936.

J. Z.

BRINDLEY (G. W.). *The structure of chloritoid*. Proc. 1st Conf. Clays and Clay Mins., Nat. Acad. Sci., Nat. Res. Council Publ. 327, Washington, 1954, 360–363.

The structure contains continuously linked octahedra

ets cross-linked by discrete SiO_4 units. The cell dimensions are a 9.52, b 5.47, c 18.19 Å, β $101^\circ 39'$, space group C_2 . [See also *Acta Cryst.*, 1952, **5**, 698–699] D. C.

ARK (J. R.) & CHRIST (C. L.). *Studies of borate minerals (VIII): the crystal structure of $\text{CaB}_3\text{O}_3(\text{OH})_5 \cdot 2\text{H}_2\text{O}$* . *Zeits. Krist.*, 1959, **112**, 213–233, 3 figs.

$\text{CaB}_3\text{O}_3(\text{OH})_5 \cdot 2\text{H}_2\text{O}$, known only as a synthetic compound, is triclinic $P\bar{1}$, a 7.05, b 9.45, c 6.41 Å, α $101^\circ 21'$, β $101^\circ 19'$, γ $99^\circ 49'$, $Z=2$, D 2.00 g/cc. The structure contains the same polyion $[\text{B}_3\text{O}_3(\text{OH})_5]^{2-}$ previously found in yerhofferrite, $\text{CaB}_3\text{O}_3(\text{OH})_5 \cdot \text{H}_2\text{O}$ [M.A. **14**–105] and in zoisite, $\text{CaB}_3\text{O}_3(\text{OH})_5 \cdot 4\text{H}_2\text{O}$ [M.A. **14**–253]. R. A. H.

RIF-VARAMBON (A.). *Étude de la substitution du silicium dans quelques types d'orthosilicates*. *Bull. Soc. franç. Min. Crist.*, 1959, **82**, 285–314, 14 figs.

A systematic crystallographic study has been made of the effect of the substitution of Ge for Si in the three orthosilicate classes SiO_4M ($M=\text{Zr}$, Th , or U) represented by zircon and monazite, SiO_4M_2 ($M=\text{Be}$, Zn , Co , Ni , Fe , etc.) represented by olivine and phenakite, and the class of eulytine, $(\text{SiO}_4)_3\text{Bi}_4$. For type SiO_4M the substitution leads to GeO_4M with the scheelite structure: the dimorphism of GeO_4Th shows the transition between scheelite and zircon structure types. For type SiO_4M_2 germanate spinels have been obtained in addition to two new Ca and Mn germanates isomorphous with olivine. A study has been made also of the effect of substituting the (SiO_4) group by other (XO_4) tetrahedral groups (with $X=\text{Cr}^{6+}$, S^{6+} , P^{5+} , etc.) in the zircon and eulytine classes. R. A. H.

ERRONI (E.) & COCCHI (M.). *Epitaxie der beiden polymorphen Phasen der CsNO_3 auf der (001)-Ebene des Muskovits*. *Zeits. Krist.*, 1959, **111**, 154–158, 1 fig.

In the epitaxy of CsNO_3 and muscovite, (100) [010] of the cubic and (11 $\bar{2}$ 1) [10 $\bar{1}$ 0] of the trigonal modification of NO_3 grow parallel to (001) [010] of the mica. The structural relations are discussed. R. A. H.

ERTSCH (H.). *Bemerkungen zum Problem des Kristallwachstums*. *Tschermak's Min. Petr. Mitt.*, 1959, ser. 3, **7**, 106–114.

Emphasizes that in dealing with problems of crystal growth attention must be given to (1) the dimensions of mosaic blocks in crystals, (2) the lower limit of super-saturation at which growth can occur, (3) the details of crystal faces and their relation to screw dislocations.

A. P.

URIEN (H.) & DONNAY (J. D. H.). *The symmetry of the complete twin*. *Amer. Min.*, 1959, **44**, 1067–1070.

The symbolism to describe twinning by merohedry or reticular merohedry, introduced by Curien and Le Corre [Bull. Soc. franç. Min. Crist., 1958, **81**, 126–132], is further elaborated for the description of the symmetry of the complete twin and some relations to group theory mentioned. A. P.

BROTHERS (R. N.). *A penetration-twin in olivine*. *Amer. Min.*, 1959, **44**, 1086–1089, 3 figs.

A porphyritic alkali basalt from the Khyber Pass, Auckland, New Zealand, showed a penetration twin of olivine, with twin plane (011). A. C. H.

[KASHENOVA (A. G.)] Кашенова (А. Г.). К морфологии ферроселита [On the morphology of ferroselite]. *Зап. Всесоюз. Мин. Общ.* [Mem. All-Union Min. Soc.], 1959, **88**, 454–456, 4 figs.

The results of goniometric measurements of ferroselite [M.A. **13**–84, 651] are given. S. I. T.

[TREIVUS (E. B.)] Трейвус (Е. Б.). Два примера ложных простых форм кристаллов [Two examples of pseudo-simple forms of crystals]. *Зап. Всесоюз. Мин. Общ.* [Mem. All-Union Min. Soc.], 1959, **88**, 456–457, 3 figs.

Cubic crystals of pyrite in which opposite cube faces showed characteristic surface etch structure, have been found in the gold fields of Berezov in the Urals. The symmetry of such crystals thus was orthorhombic $C3L$ $3P$. This effect is explained by the mosaic structure of the crystals being made of 'brick-shaped' units and such a structure is explained as being due to the heterogeneity of the flow of the feeding solution. S. I. T.

[МЯЗ (N. I.), FRANK-КАМЕНЕТСКИЙ (V. A.), & КАМЕНТСЕВ (I. E.)] Мязь (Н. И.), Франк-Каменецкий (В. А.) и Каменцев (И. Е.). Закономерное срастание кварца и пирита [Natural intergrowth of quartz and pyrite]. *Зап. Всесоюз. Мин. Общ.* [Mem. All-Union Min. Soc.], 1959, **88**, 460–464, 8 figs.

The study of a crystal of quartz containing crystals of iron pyrite showed a regular intergrowth between these two minerals. The cube faces of pyrite {001} coincide with the rhombohedra faces of quartz {10 $\bar{1}$ 1} and the remaining zones agree in the following manner:

Pyrite	[1 $\bar{1}$ 0], [111], [110], [110]
Quartz	[1 $\bar{2}$ 10], [0001], [10 $\bar{1}$ 2], [$\bar{1}$ 2 $\bar{1}$ 0]

S. I. T.

[ABDULLAEV (G. K.)] Абдуллаев (Г. К.). Штриховка на гранях кристаллов пирита [Striation of the crystal faces of pyrite]. *Зап. Всесоюз. Мин. Общ.* [Mem. All-Union Min. Soc.], 1959, **88**, 465–467, 1 fig.

Combination striation on crystal faces of pyrite characterized by the combination of two rational faces is discussed, and an attempt is made to correlate it with the genetic stages of the crystals. S. I. T.

[GRIGORIEV (D. P.)] Григорьев (Д. П.). О скорости кристаллизации минералов [*Velocity of mineral crystallization*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 497-511, 10 figs.

Various methods of measuring the velocity of crystallization of several minerals and the results obtained are described and discussed. It is concluded that at the present time it is quite possible to measure both the absolute and the relative (linear and volume) velocities of crystal growth by using various methods. S. I. T.

[GENDELEV (S. SH)] Генделев (С. Ш.). Штриховка роста на кристаллах и ее минерагенетическое значение [*Growth striation on crystals and its mineral-genetic significance*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 512-520, 7 figs.

The combination striation on faces of various artificial compounds and minerals was studied by means of a binocular microscope, two-circle goniometer, and special profile-measuring apparatus. It is concluded, among other things, that in a growing crystal the lower faces tend to develop a coarser striation than the upper ones. S. I. T.

[ГОДОВИКОВ (А. А.)] Годовиков (А. А.). О некоторых особенностях изоморфизма диарсенидов кобальта, никеля и железа [*On certain features of isomorphism of cobalt, nickel, and iron diarsenides*]. Труды Минер. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 74-85, 2 figs.

On the basis of chemical and X-ray data the mutual relations, the isomorphism, and the cell parameters of safflorite, löllingite, rammelsbergite, and paramrammelsbergite are discussed. [M.A. 10-204]

S. I. T.

[КАМЕНТСЕВ (И. Е.)] Каменцев (И. Е.). К вопросу о влиянии активной подложки на изменение облика кристаллов апатита [*On the influence of the active lining upon modification of the habit of apatite crystals*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, 705-708, 5 figs.

It was found that the habit of apatite crystals varies with the nature of minerals intergrown with them. Intergrowths of apatite with scapolite, garnet, calcite, and oligoclase were studied.

S. I. T.

KEITH (R. E.) & GILMAN (J. J.). *Dislocation etch pits and plastic deformation in calcite*. Acta Metallurgica, 1960, **8**, 1-10, 21 figs.

The authors describe the development and results of an etch-pitting procedure for calcite crystals. Calcite was used because of its plastic properties, and its capacity for mechanical twinning. Etch-pits were produced using a number of different reagents. The pits were found to have unique shapes characteristic of each chemical, its concentration, and the diluent used with it. Concentrated formic acid produced the most satisfactory pits, and it was verified that these pits resulted from dislocations. The known glide elements of calcite were confirmed by arrangement of etch-pits on the glide planes. Dislocation structures were observed in twins.

R. G. Wils

ECONOMIC MINERALS AND ORE DEPOSITS

GRAY (ANTON). *The future of mineral exploration (The fourth Sir Julius Wernher Memorial Lecture of The Institution of Mining and Metallurgy)*. Trans. Inst. Mining & Metall., London, 1959, **68**, 23-34.

It is suggested that the demand for the major metals will double before the end of the century. 'If more mining geologists will relax their obsession with the theoretical possibilities of hypothetical magmas, and help to solve the structural and chemical problems of metamorphism, we may have in the near future the understanding needed to guide us to ore deposits'. R. A. H.

WILLIAMS (D.). *Mineral exploration*. Proc. Geol. Assoc., 1959, **70**, 125-157.

A review of traditional and modern prospecting methods (A presidential address.) M. G. B.

HAWLEY (J. E.). *The magmatic vs metamorphic sources of ore—a presidential address*. Trans. Roy. Soc. Canada, sect. 4, 1956, **50**, 1-18.

This paper reviews the magmatic and metamorphic processes by which ores may be concentrated. It is concluded that both may play a part in the concentration of ore fluids and resulting deposits, but the former seem much the more efficient and likely, and best explain textures and mineral occurrences in the Superior and Grenville structural provinces of eastern Canada. Metamorphism is undoubtedly effective in redistributing former ore deposits and in

mation of some of the more diffuse deposits and smaller boundary hydrothermal deposits in areas where contemporaneous vulcanism is missing. E. W. N.

ABDULLAEV (KH. M.) Абдуллаев (Х. М.). Генетическая связь оруденения с гранитоидными интрузиями [*Genetic connection of ore deposits with granitoid intrusions*]. Гос. Науч.-Техн. Изд. Геол. [State Sci.-Techn. Publ. Geology], Moscow, 1954, 294 pp., 68 figs. Price 10r. 60k.

This book is devoted mainly to a critical discussion of problems of the genesis of ore deposits connected with intrusive acid magmas. The author emphasizes strongly the importance of considering, not only the physical and chemical factors of the ore-forming fluids, but also the geological-tectonic setting of these ores. Also he emphasizes the importance of assimilation and hybridism as factors of ore deposition, especially in the environment of the upper crustal zones which are the main region of the action of magmatic emanations and in which often the 'differential metallicity' of ore deposits is formed. Petrochemical consideration of rocks and ore deposits based on numerous examples in various parts of the world lead the author to a new type of classification of the contact metasomatic and hydrothermal ore deposits. The book is particularly rich in references to modern Soviet literature on this subject.

S. I. T.

ABDULLAEV (KH. M.) Абдуллаев (Х. М.). Дайки и оруденение [*Dykes and ore formation*]. Гос. Науч.-Техн. Изд. Геол. [State Sci.-Techn. Publ. Geology], Moscow, 1957, 232 pp., 92 figs. Price 16r. 55k.

This book contains a very detailed study of dykes and their relations to ore deposits, and is mainly based on recent Soviet literature. A number of new terms is proposed by the author, such as endodykes (igneous dykes), metadykes (placement dykes), exodykes (sedimentary dykes), subintrusive dykes, perimagmatic, intramagmatic, and other types of dykes. The position of the dyke phase of intrusion in the history of the developing geosyncline, the relation of dykes to the intrusive and extrusive igneous rocks, and the influence of tectonic factors, are subjects discussed in detail. There are also discussions of the petrological composition of dykes, and of composite and multiple dykes; a genetic classification of dykes is proposed. The second half of the book (pp. 134-225) is devoted to the description of geological regions where dykes are found in association with ore deposits, together with a discussion of the relation between dykes and ores, and of the connection between the igneous magmas and ore-forming fluids; a number of suggestions and hypotheses are made, but no final conclusions are reached, because of the imperfect state of our knowledge at the present time.

S. I. T.

[KORMILITSYN (V. S.) & IVANOVA (A. A.)]. Кормилицын (В. С.) и Иванова (А. А.). Генетические особенности калангуйского сульфидно-флюоритового месторождения (Восточное Забайкалье) [*Genetic peculiarities of the Kalangui sulphide-fluorite deposit (East Transbaikalia)*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 377-394, 13 figs.

A beaded mineral vein 0.5 to 20 metres in thickness and over 1 km in length is described. It has a symmetrical zonal structure: (1) breccia zone with fragments of country rocks and banded fluorite cemented by porcelain-like fluorite-quartz aggregate and rodlike fluorite, (2) rodlike fluorite zone, (3) pyrite zone, (4) spherulitic marcasite zone presenting kidney-shaped surfaces to the central vein cavities. The genetic aspect of crystallization of colloidal and true hydrothermal solutions is discussed. S. I. T.

[BORSHINSKAYA (S. S.)] Боршинская (С. С.). О применении таблицы диагностических признаков рудных минералов в полированных шлифах [*On the use of a table of diagnostic features of ore minerals in polished sections*]. Труды Минер. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 146-147, 1 table.

Ore minerals are arranged in a table according to their reflectability for green, yellow, and red light. For each mineral its chemical composition, effect of anisotropism, symmetry, hardness, and etching characteristics are listed. The table can be used as an aid in determination of ore minerals.

N. R.

BOYER (FRANÇOIS) & ROUTHIER (PIERRE). *Observations sur deux niveaux minéralisés dans le Paléozoïque inférieur des monts du Minervois (Montagne Noire, Aude). Minéralisation, lithologie et stratigraphie. Contribution au débat syngénèse-épigénèse.* Bull. Soc. géol. France, 1958, **8**, 257-266.

A weak mineralization, comprising mainly galena, pyrite, and baryte, occurs at the top of the calc-dolomitic stratum of the Upper Georgian of Montagne Noire and extends for more than 12 km. The constant association of the mineralization with a particular rock-type, calcareous jasper, points to the synchronism of concentration of the metals and deposition of the sediment. A mineralization of galena and blende strictly localized within a marmorized limestone-nodular calcareous shale horizon, regarded as middle Tremadoc, has been followed for over 3 km. The mineralized horizons of the Minervois add thus another item to the already long list of metalliferous deposits more or less strictly related to sedimentological and palaeogeographical controls.

E. J. & A. S.

VINCIENNE (HENRI). *Sur la métallogénie de la région d'Akjoujt (Mauritanie).* Bull. Soc. géol. France, 1958, **8**, 245-255.

The geological and metallogenic characters of the three large carbonated and mineralized masses of west Guelb Moghrein, Legleitit el Khader, and of Tabrinkout, all in the Akjoujt region, are reviewed. These syntectonic deposits represent a high temperature mineralization which comprises, without appreciable discontinuity, two phases: the earlier a paragenesis, derived from basic rocks, with ferrous carbonates, magnetite, ores of titanium, nickel, cobalt, and copper, activated and concentrated by metasomatism arising with the ascent of migmatites in the lower part of the Akjoujt series; the later a pneumatolytic paragenesis of acid pegmatites penetrating the same series and related to and only little later than the migmatites, giving quartz, tungsten, molybdenum, bismuth, and gold. West Guelb Moghrein and Tabrinkout represent the two extreme terms of the mineralization. E. J. & A. S.

BELEZKIY (V.) & GUIMARÃES (DJALMA). *Sobre uma ocorrência singular de platina e geologia da parte central da Serra do Cipó*; and, *Notas à margem de 'O Paládio e a Platina no Brasil'*, de E. Hussak. Divn. Fom. Prod. Mineral., Dept. Nac. Prod. Mineral., Rio de Janeiro, 1959, Bol. no. 106, 102 pp., 10 figs., 21 sketches, 5 tables, 2 geol. maps.

Platinum is observed as: concentrations in quartzites, concentrations in conglomerates, concentrations in serpentine or remnant apophyses of an ultrabasic rock. Stratigraphic, petrographic, tectonic, and geochemical aspects are considered. Two analyses of palladic platinum of Condado, Serro, Minas Gerais, show Pt 73.99, 72.96, Ir 0.08, 0.88, Pd 21.77, 21.82, Fe 0.10, tr., n.d. (Rh,Os) 3.14, 3.92, insol. 0.92, 0.42; sp. gr. 16.26, 16.34. Concretions of platiniferous palladium from Fazenda Limeira, Morro do Pilar, have Pt 34.96, Pd 64.44, Fe₂O₃ 0.26, SiO₂ 0.89, Au tr., =100.55; sp. gr. 15.3. A. B. R.

SWEET (JESSIE M.). *British gold from the Bouglise collection*. Min. Mag., 1960, **32**, 420-421.

Native gold occurs in minute grains and crystals in a quartz gossan with caledonite, linarite, cerussite, and hemimorphite, in a specimen labelled 'Cumberland, England', from an old collection. The associated minerals resemble those from Red Gill, in the Caldbeck Fells, Cumberland.

R. A. H.

RUSS (W.). *The geology of parts of Niger, Zaria and Sokoto provinces, with special reference to the occurrence of gold*. Geol. Survey Nigeria, Bull. no. 27, 1957, 42 pp., 2 figs., 15 tables, 13 pls. (incl. 2 folding maps).

Petrological descriptions are given of basement rocks with chemical analyses of 10 gneisses, 9 paragneisses, 6 schists of heterogeneous origin, and 13 granites and

associated rocks. Gold occurs in alluvial deposits, eluvial deposits, lodes, and conglomerates. Galena, pyrite, chalcocite, arsenopyrite, malachite, azurite, stolzite, and tourmaline are associated with gold in quartz lodes. Tin, osmium and mercury have been found in gold-bearing alluvium. Beryl occurs in a tourmaline pegmatite. The finds of diamonds in Nigeria are recorded. K. C. H.

CLARK (WILLIAM B.). *Mines and mineral resources of Joaquin County, California*. California Journ. Min. Geol., 1955, **51**, 21-95.

The principal economic mineral products include gold, platinum, silver, manganese, and nonfuel, nonmetallic commodities. K. S.

CARLSON (DENTON W.). *Mines and mineral resources of Sacramento County, California*. California Journ. Min. and Geol., 1955, **51**, 117-199.

The principal economic mineral products include gold, silver, platinum, natural gas, and nonfuel, nonmetallic commodities. K. S.

MERRIAM (RICHARD). *Geology of Santa Ysabel quadrangle, San Diego County, California*. California Divn. Min. Bull. no. 177, 1958, 7-20. Price \$1.50.

STEWART (RICHARD M.). *Mines and mineral resources of Santa Ysabel quadrangle, San Diego County, California*. Op. cit., 1958, no. 177, 21-42.

Gold was the principal economic mineral commodity. Marble, nickel, wolfram, graphite, and wollastonite occur in uneconomic amounts. K. S.

RHODEN (H. N.). *Structure and economic mineralization of the Silvermines district, County Tipperary, Eire*. Trans. Inst. Mining & Metall., London, 1959, **68**, 67-94, 1 fig.

An account is given of the geology, folding, and complex faulting in the Silvermines district. Hydrothermal mineralization along the Silvermines fault developed several lead, lead-zinc, and baryte orebodies of economic significance. [M.M. **14**-350, **32**-128] R. A. H.

KRAUSKOPF (KONRAD B.). *Physical chemistry of quaternary silver transportation in vein fluids*. Econ. Geol., 1959, **46**, 498-523.

Possible mechanisms for the transportation of quaternary silver in vein fluids are examined by the methods of chemical thermodynamics. Mechanisms shown to be feasible are: transportation as HgS₂²⁻ in alkaline sulfide solutions; the volatile chloride in the vapour phase, and as the vapour of the element itself. Other mechanisms considered

own to be impossible or uncertain. The separation of cinnabar deposits from deposits of most other sulfide ores may be ascribed to the thermal instability of HgS.

A. P.

JACKSON (FRANK W.) & TUNELL (GEORGE). *The saturation curves of cinnabar and metacinnabar in the system HgS-Na₂S-H₂O at 25°C.* Science, 1954, **119**, 467-468, 1 fig.

Weight percentage of HgS varies from 0.21 to 15.59 in solutions saturated with cinnabar over an Na₂S concentration range from 0.95 to 9.64. At all concentrations Na₂S the solubility of metacinnabar exceeds that of cinnabar. The saturation curves are plotted on a triangular diagram. [M.A. 14-336, 404]

A. P.

JUMANN (HENRICH). *Kobberforekomstene på Straumshøia.* Norges Geol. Unders., 1955, **191**, 18-29, 5 figs. (English summary.)

The deposits are located in the northern part of Setesdal Southern Norway, in a rock complex probably belonging to the Telemark Formation. They have been known for more than 250 years, and have been worked on a small scale. The ore occurs in pegmatite. The following minerals are now known to occur in the deposits: plagioclase, quartz, potash feldspar, biotite, delessite, garnet, magnetite, apatite, yellow beryl, brookite, epidote, fluorite, chalcocite, bornite, malachite, chrysocolla, uraninite, monazite, uranotile. Brookite and kasolite are new species from Norway. Old museum specimens of cyprine from Straumshøia do not belong to this paragenesis; their quality has not been rediscovered.

I. W. O.

VOKES (F. M.). *The copper deposits of the Birtavarre district, Troms, northern Norway.* Norges Geol. Unders., 1957, **199**, 1-239, 13 pls., 67 figs.

Sub-economic chalcopyrite-pyrrhotine deposits occur as thin, elongated, concordant lenses in schists of epidote-amphibolite to amphibolite facies in the eastern, marginal zone of the Caledonides at 69°N. lat. Deposits are confined to a single stratigraphic division, being especially concentrated where normally NW-trending lineation swings to E-W. The longer axes of the lenses are always strictly parallel to the lineation. The petrology and chemistry of the schist and amphibolite country rocks are discussed (9 silicate analyses). Descriptions of the structural features of the bodies are given from drill cores and old workings. The sulphide mineralization comprises breccia- and replacement-ore and the following minerals have been identified: pyrrhotine, chalcopyrite, blende, cubanite; in minor amounts pyrite, valleriite, molybdenite, galena, arsenite, and magnetite. Temperatures of formation are

approx. 500°C according to the FeS-ZnS geothermometer.

The chemistry of the main and trace elements is reviewed. In pyrrhotine Co < Ni, suggesting an hydrothermal rather than a magmatic origin. The geochemistry of Ag, Mo, Cd, and Mn in the sulphide minerals is discussed. Metasomatic alteration of wall-rocks involves formation of garnet-anthophyllite-rich types. Analyses of the garnet and the anthophyllite are given. The alteration is traced chemically by means of 5 silicate analyses. It involves addition of Mg and Fe, removal of Ca and alkalis. Author suggests origin of ores is connected with deep-seated palaeogenic processes taking place during the Caledonian orogeny. The geosynclinal sedimentary and volcanic rocks were the ultimate source of the sulphur and metals, which were mobilized during the orogeny and subsequently deposited along later stage thrust-planes.

I. W. O.

VOKES (F. M.). *Some copper sulphide parageneses from the Raipas formation of northern Norway.* Norges Geol. Unders., 1957, **200**, 74-111, 8 figs., 3 pls.

The Precambrian Raipas Formation in west Finnmark and Troms contains copper deposits showing two distinct parageneses, chalcopyrite-pyrite-pyrrhotine-deposits, and deposits of more copper-rich minerals. Two deposits of the latter type are described and discussed in more detail. In one of them (Ulveryggen) the following ore minerals have been identified: bornite, chalcopyrite, neodigenite, covellite, hematite, magnetite. The neodigenite is most probably of hypogene origin. The paragenesis of the other deposit (Raipas mine) appears to be: siegenite, bornite, chalcopyrite and tennantite (?), neodigenite, chalcocite, covellite, 'secondary' chalcopyrite, unknown sulphide.

I. W. O.

VOKES (F. M.). *On the presence of minerals of the linnaeite series in some copper ores from the Raipas formation of northern Norway.* Norges Geol. Unders., 1957, **200**, 112-120, 1 pl.

Two minerals of the linnaeite series, siegenite and carrollite, have been identified and examined in ores from two localities in the Alta district of Finnmark. They are new species for Norway. Associated minerals are bornite, chalcopyrite, neodigenite, covellite. In the siegenite-bearing ore tennantite also is found.

I. W. O.

[SMIRNOV (F. L.)] Смирнов (Ф. Л.). Редкие минералы в борнитовых рудах медноколчеданного месторождения на Северном Кавказе [*Rare minerals in the bornite ores of a copper pyrite deposit in the northern Caucasus*]. Труды Минер. Муз. Акад. Наук СССР, [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 171-179, 8 figs.

The following minerals are described: sylvanite, luzonite, renierite, and germanite (?).

S. I. T.

MENDELSON (F.). *Structure of the Roan Antelope deposit.*

Trans. Inst. Mining & Metall., London, 1959, **68**, 229-263, 10 figs., 7 pls.

The Roan Antelope copper deposit on the southern end of the Northern Rhodesian Copperbelt lies in a synclinal remnant of the Katanga System. Folding was due to a combination of flexure folding, predominant in the early stages, and cleavage shear folding, predominant in the later stages. The mechanism of cleavage folding is analogous to the opening of an ordinary hand fan [a working model is enclosed]. In a series of folds with different plunges the direction of movement varies across the folds through a series of curved paths, being perpendicular to the fold axes only at the axial planes. Sanders' definitions of fabric axes are modified to include these conditions. The procedures used in solving structural problems are reviewed.

A. R. A. H.

MARTINELLI (JOSÉ AUGUSTO) & FILHO (JOSÉ DO VALLE NOGUEIRA). *Prospecção geoquímica de cobre no Rio Grande do Sul.* Bol. Soc. Brasileira de Geol., 1959, **8**, 5-15, 6 figs.

Geochemical prospection of the Caçapva-Lavras do Sul copper districts, Rio Grande do Sul state, is described. The Cu content of the soils is under 100 p.p.m. in barren areas, 1000 p.p.m. in samples from the outcrops of the veins of Camaqua property, and a maximum of 3500 p.p.m. on mineralizations at Seival property. New areas for prospecting are recommended.

A. B. R.

IBRAHIM (NAZMY AZER). *Beitrag zur Kenntnis ostalpinen Fahlerze. Teil I. Erzmikroskopische Untersuchungen.* Tschermak's Min. Petr. Mitt., 1957, ser. 3, **6**, 226-237, 8 figs. *Teil II. Chemische Untersuchungen von Fahlerzen.* Ibid., 238-245.

In part I ore microscopic observations on 33 polished specimens of tetrahedrite-bearing ores from 11 Austrian localities are described. In part II complete chemical analyses of tetrahedrites from four of the samples are reported, together with cell dimensions, observed and calculated densities. The results are compared with earlier analyses of tetrahedrites from the same localities.

A. P.

HUBAUX (A.). *Les gisements de tennantite de Yungu et de Sele (Lac Tanganika).* Ann. (Bull.) Soc. Géol. Belgique, 1958-1959, **82**, B269-282, 1 fig.

The primary minerals include quartz, barytocelestine, chalybite, and tennantite with a little chalcopryrite, bornite, and pyrite; as secondary are found azurite, quartz, chrysocolla, wad, limonite, pharmacosiderite. The wall-rocks include granites and pegmatites, amygdaloid, quartz-

diorite, dolerite, and pyroxenites; the acid rocks are in Ba and Sr. This deposit appears to be the only one of this type in East Africa.

J. M.

VANDENVEN (C.). *Étude de la minéralisation du fer stannifère de N'Zombe (Kivu, Congo belge).* Ann. (Bull.) Soc. Géol. Belgique, 1958-1959, **82**, B337-344, 4 figs., 4 photos.

The minerals of the N'Zombe vein fall into two categories: high temperature (600° to 400°C) minerals—cassiterite, mispickel, and a part of the pyrrhotine; hydrothermal phase (400° to 100°C) pyrrhotine, pyrite, chalcopryrite, chalybite; quartz is ubiquitous. Pyrrhotine is transformed, on cooling, to pyrite and marcasite. Chalybite serves as an index of cassiterite mineralization only in the uppermost part of the deposit. In depth it may disappear, though the cassiterite mineralization persists.

J. M.

LAYTON (W.). *The geology of 1/4° field sheet No. 32.* Geol. Survey Bull. no. 24, 1958, 66 pp., 3 figs., 53 pls. (incl. 7 folding maps and sections).

Petrographic descriptions of metamorphosed Birrimian sedimentary and volcanic rocks, later granites, and overlying Togo sediments are given. Cassiterite and monazite occur in pegmatites, and columbite, tantalite, wolfram, scheelite, monazite, zircon, gold, and platinum in sand and gravels.

K. C. F.

[ZUEV (V. N.)] Зуев (В. Н.). О своеобразном зональном строении шеелита и вольфрамита [On an unusual zonal structure in scheelite and wolframite]. Труды Мин. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. U.S.S.R.], 1959, **9**, 185-189, 6 figs.

Scheelite and manganiferous wolframite containing 20-96% MnWO₄ are found to be mutually replaceable and give rise to alternate zones of these minerals. The origin of this structure is attributed to rapid alternations in the nature of solutions occasioned by tectonically unstable conditions. Textural evidence for two generations of scheelite, wolframite, and quartz is presented.

N. H.

OFTEDAL (IVAR). *On the occurrence of tellurium in Norwegian galenas.* Norsk Geol. Tidsskr., 1959, **75**-79.

The paper reports a semi-quantitative spectrographic examination for Te in a number of Norwegian galenas and a few other minerals. The analytical method is described. Te in galena is found to be in the concentration range <10-1000 p.p.m., typically in amounts less than 10 p.p.m. The galenas of the Oslo district appear to be on an average higher in Te than those from other areas. The Te figures are compared with figures for Tl, Bi, and Sb determined

riier [Ofstedal (I.), Vid.-Akad. Skr., Oslo, 1940, no. 8]. High Te concentrations in galena are typically accompanied by unusually high contents of Bi and Tl. High temperatures are suggested to favour the entry of Te in galena. The element association Te-Bi-Pb-Tl is characteristic in a sulphide environment.

K. S. H.

OFSTEDAL (IVAR). *Native bismuth in the molybdenite deposit at Skjoldevik, Haugesund Peninsula, western Norway.* Norsk Geol. Tidsskr., 1959, **39**, 81-82.

A spectrographic survey for host minerals to Te showed the molybdenite crystal from Skjoldevik, Norway, to contain Te in excess of 100 p.p.m. Te could not be detected in molybdenites from 20 other examined deposits. The spectrographical analysis also revealed much Bi in the Skjoldevik specimen, and a careful inspection of the specimen showed native bismuth to be present. The identification was confirmed by X-ray powder diagrams. The Te content of the native bismuth is assumed to be of the order of a few per cent. The mineral occurs in a quartz-chalcopyrite vein in the vicinity of a granite body. Bi- and Te-rich galena is found in a neighbouring vein.

K. S. H.

ANDVLIET (J.). *The geology of the upper Salat and Pallaresa valleys, Central Pyrenees, France/Spain.* Leidse Geol. Mededelingen, 1960, **25**, 1-127, 46 figs., 2 tables, 3 maps. (Spanish summary.)

In a special chapter on igneous rocks and ores attention is paid to the petrography and mineralogy of this area. At many points in the Lower Palaeozoic along the northern boundary of the Auzat-Bassières granodiorite are found lead, zinc, iron, and copper ores, especially galena and blende. A few occurrences were already known in Roman times but renewed prospecting has taken place in the Carbauère area. A description of a talc occurrence of the Fontaine de la Sèze (Sèsse Valley) is also given.

P. C. Z.

HOMSON (J. E.). *Geology of Falconbridge Township.* Ann. Rept. Ontario Dept. Mines, 1957, **66**, pt. 6, 36 pp., 8 figs., 9 maps.

Precambrian volcanics and sediments are intruded by granite, syenite, and gabbro including part of the Sudbury nickel irruptive and main Sudbury gabbro. Four chemical analyses of the lavas are given, and the theories of origin of the nickel irruptive and Sudbury breccia are summarized. The structure and mineralogy of the Falconbridge ore deposit (pyrrhotine, pentlandite, chalcopyrite, and chalcocite) are described.

J. A. M.

JUNGGREN (P.). *The soft iron ores of Vermlands Taberg.* Geol. Fören. Förh. Stockholm, 1958, **80**, 59-70, 2 figs. The magnetite ores of Vermlands Taberg in central

Sweden are found together with skarn minerals of the tremolite and diopside types. X-ray analyses (powder data) and differential thermal analyses show that large portions of the ores have suffered a transformation into goethite, and that adjacent skarn rocks have contemporaneously changed into a clayey substance almost entirely made up of antigorite. The chemical changes and the mineralogical transformations of ores and rocks are discussed, and several chemical analyses of unaltered ores and soft iron ores are given.

E. W.

CARSTENS (HARALD). *Investigations of titaniferous iron ore deposits. Part I, Gabbros and associated titaniferous iron ore in the West-Norwegian gneisses.* Det Kgl. Norske Vidensk. Selsk. Skr., 1957, no. 3 (Trondheim), 67 pp., 33 figs. *Part II, Gabbro, anorthosite, and titaniferous iron ore on Flakstadøy in Lofoten, Northern Norway.* Ibid., 1957, no. 4, 24 pp., 11 figs.

A few gabbro intrusions, some of which are associated with titaniferous iron ore deposits, have been selected for detailed petrographic examination. Three main types of gabbro are distinguished: fine-grained olivine gabbros and troctolitic gabbros, medium to coarse-grained hypersthene-olivine gabbros, and olivine-free gabbros. The two latter types may be very rich in iron ore and grade into titaniferous magnetite concentrations. The consolidation of the rocks and their metamorphism is considered to be a continuous process, the trend of the metamorphism being controlled by the amount of water present in the late (deuteric) stages. Characteristic features such as clouded plagioclase and reaction rims are described. It appears that the parent magma is represented by the fine-grained olivine gabbros, and that the iron-rich gabbros are products of a differentiation by fractional crystallization in situ. Titaniferous iron ore deposits were formed twice during the differentiation of the gabbros.

An iron-rich gabbro containing bands of magnetite-pyroxenite at the base is described from Flakstadøy. The upper part of the gabbro is porphyritic with large phenocrysts of plagioclase. Associated anorthosite seems to have formed by accumulation of plagioclase from a gabbroic magma. It is proposed that ore might be formed by expulsion of Fe and Ti from the pyroxene lattice at a late magmatic stage.

I. W. O.

CARSTENS (HARALD). *A note on the distribution of ferrides in accumulative iron ores.* Norsk Geol. Tidsskr., 1958, **38**, 253-256.

The texture of the titaniferous iron ore from Ulvön, Sweden, is described and interpreted. Spectrographic analyses of Ti, V, Cr, Co, Ni, and Mn in magnetite, olivine, augite, and plagioclase from different grades of ore and

from the dolerite are presented, and the distribution pattern of the elements is discussed. K. S. H.

BATES (D. A.). *Report of the Director for 1957-1958, Ghana Geological Survey.* 1959.

p. 6. Titaniferous magnetite occurs as a magmatic segregation in an epidiorite near Pudo, northern Ghana; chem. anal. SiO_2 2.0, Al_2O_3 2.0, Fe_2O_3 75.0, FeO 7.0, MgO 0.9, TiO_2 11.0, Cr_2O_3 0.8. K. C. B.

[ONTOEV (D. O.)] Онтосев (Д. О.). О колломорфных образованиях магнетита и своеобразных пластинчатых и таблитчатых выделениях пирита в магнетитовых рудах [On collomorphic formations of magnetite and unusual lamellar and tabular forms of pyrite in magnetite ores]. Труды Минер. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 74-85, 12 figs.

Unusual crystallographic modifications of magnetite and pyrite are described from the Kourzhun-Kulskian contact metasomatic ore-zone found in Kustanaiskian region. It is suggested that the magnetite is precipitated from a high temperature colloid, while pyrite represents a replacement product of pyrrhotine and certain gangue minerals. N. R.

OFTEDAHL (CHRISTOFFER). *Note on gel structures in a pyrite bed, the Grong district.* Norges Geol. Unders., 1959, **205**, 107-110, 2 figs.

Spherical structures, 1 to 2 mm in size, in pyrite ore of the so-called vasskis- or Leksdal-type are interpreted as gel structures formed in the sea water. This interpretation supports the generally accepted view that the Leksdal-type ore is of exhalative-sedimentary origin. I. W. O.

[SMIRNOV (F. L.) & YAKOVLEV (L. I.)] Смирнов (Ф. Л.) и Яковлев (Л. И.). О германите в рудах одного из колчеданных месторождений Центрального Казахстана [On germanite from the ores from one of the pyrite deposits of Central Kazakhstan]. Труды Минер. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 180-184, 8 figs.

S. I. T.

GOOCH (EDWIN O.). *Iron in Virginia.* Virginia Divn. Geol. Min. Resres., 1954, Circ. **1**, pp. 1-17, 12 figs.

In addition to a discussion of iron minerals in Virginia, numerous prospects and mines are shown on maps of the eleven districts. R. S. M.

FOURIE (G. P.). *The chromite deposits in the Rustenburg area.* Geol. Surv. Union of South Africa, 1959, Bull. **27**, 1-45, 10 figs., 1 pl.

Seventeen new analyses of ores are given. The author favours a theory of origin involving liquid segregation. M. M.

COETZEE (C. B.). *Manganiferous iron ore, hematite, barite and sillimanite on Gams (Portion 1), Namaqualand.* Geol. Surv. Union of South Africa, 1958, Bull. **1**-29, 4 pls.

The mineralogy of the ores is described and twenty chemical analyses given. M. M.

[ZUEV (V. N.)] Зуев (В. Н.). Парагенезис ванадиевых минералов в одном из местонахождений Восточного Забайкалья [Paragenesis of vanadium-bearing minerals in one of the ore-fields of the Eastern Transbaikalian region]. Труды Минер. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 176-184, 6 figs., 1 table.

Vanadinite and the associated minerals were found in the zone of oxidation of a quartz vein emplaced in biotite-hornblende granite. The primary ore is patronite, pyrite, gold, scheelite, wolframite, and galena and the secondary minerals include vanadinite, pyromorphite, chillagite, wulfenite, cuprodesclowitzite, cerussite, malachite, azurite, and hydrous oxides of iron. Brief descriptions of these minerals are given as well as the chemical analyses of vanadinite (PbO 70.67, PbCl_2 9.47, V_2O_5 17.87, insol. res. 0.50, losses 0.28, H_2O — 0.08) and of chillagite (MnO 16.18, WO_3 30.09, PbO 51.59, CaO 1.49, MgO 0.11, R_2O_3 0.86, losses 0.25, H_2O — 0.04, analysis by Shepetouni). It is suggested that the vanadium of the secondary minerals is derived from the primary ore material. N. R.

SKJESETH (STEINAR). *Uran i kambrisk alunskifer i Oslofeltet og tilgrensende områder.* Norges Geol. Unders., 1958, **203**, 100-111, 6 figs. (English summary.)

All over the examined area the highest uranium concentrations are found in the Upper Cambrian zones 2c-2d. The U contents in these zones are from 50 to 100 p.p.m., the maximum value observed being 170 p.p.m. The layers containing up to more than 50 p.p.m. U are 5 to 15 m thick but the distribution across these layers is rather uneven chiefly because they contain lenses and layers of limestone which are nearly free of uranium. Uranium-rich graphitic schists found in the Norwegian Caledonides (e.g., northern Norway) may correspond to the Upper Cambrian aluminous shales. I. W. O.

BOWIE (S. H. U.). *Note on uranium and thorium occurrence in the Federation of Rhodesia and Nyasaland.* Chronique des Mines d'Outre-Mer et de la Recherche Minière, 1959, **279**, 5 pp. (in French and English).

the Northern Rhodesian Copperbelt is considered on chemical and geological grounds to be one of the most favourable areas for uranium in British African territories. The Nkana mine pitchblende, coffinite, and brannerite occur in a quartz-feldspar-mica rock. In Nyasaland the best occurrence is at Tambani, where betafite and urambite occur in feldspathic aplites in a syenite-gneiss, and davidite and allanite occur in pegmatite in biotite gneiss overlying the syenites.

R. A. H.

FROY (JACQUES) & SARCIA (JACQUELINE). *La notion de gîte épithermal uranifère et les problèmes qu'elle pose.* Bull. Soc. géol. France, 1958, **8**, 173-190.

The authors emphasize the abnormal character of the uraniferous veins of Limousin relative to those of classical hydrothermal type. They suggest a theory of genesis by selective concentration of certain lithophile elements by circulation of commonplace fluids through hydrolyzed and zoned zones of the granite batholiths.

E. J. & A. S.

LIBINA (T. V.), BOGDANOV (YU. V.), & OZHINSKY (I. S.) [Билибина (Т. В.), Богданов (Ю. В.) и Ожинский (И. С.)]. Об урановом оруденении осадочно-метаморфического типа в докембрийских мраморах и скарноподобных породах [*Uranium ore formation of sedimentary-metamorphic type in pre-Cambrian marbles and skarnlike rocks*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 369-376, 5 figs.

Uraninite is present in limestones, skarn-like marbles, and to a lesser degree in metamorphic schists of Proterozoic age in an unnamed locality. It is particularly abundant in carbonate rocks rich in fluorapatite and graphite-like substances. It is also found as inclusions in diopside and other minerals. It is suggested that the primary uranium mineralization took place during the original sedimentation and diagenesis of the sediment which was rich in phosphate and organic matter. Subsequent metamorphism and tectonic movements produced a certain redistribution of the original uranium compounds leading to their concentration in favourable locations.

S. I. T.

MOSEMANS (P.). *La bauxite dans le Bas-Congo.* Bull. Acad. roy. Sci. Colon., Bruxelles, 1959, **5**, 457-469, 4 figs.

The bauxite is of poor quality similar to that of French Guiana and Portuguese Guinea.

J. M.

KEYSER (W. L.). *Note concernant la composition et le traitement des bauxites du Bas-Congo.* Bull. Acad. roy. Sci. Colon., Bruxelles, 1959, **5**, 975-991, 6 figs.

Chemical, thermal, and X-ray comparisons are drawn

between bauxites from various sources. Analyses of three average specimens from the Bas-Congo are:

SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	Ign. loss
5.10	40.6	28.3	3.5	22.30
5.60	38.5	30.5	4.10	21.10
5.60	39.7	28.7	4.5	21.30

J. M.

STAS (M.). *Contribution a l'étude géologique et minéralogique des bauxites du nord-est du Mayumbe.* Bull. Acad. roy. Sci. Colon., Bruxelles, 1959, **5**, 470-493, 4 figs.

The laterites of this region are composed mainly of kaolinite, goethite, and sometimes gibbsite; the more considerable the content of gibbsite the greater is the loss on ignition of the laterites. The best values for alumina do not exceed 40%. The rocks are thus bauxitic laterites and not good quality bauxites.

J. M.

[GINSBURG (A. I.) Гинзбург (А. И.)]. Сподумен и процессы его изменения [*Spodumene and the processes of its alteration*]. Труды Минер. Муз. Акад. Наук СССР. [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 19-52, 26 figs., 2 tables.

The paper is a review of spodumene as found in pegmatites. The mineralogical characters of spodumene-bearing veins and of the mineral are described. Ten chemical analyses, quoted from Soviet sources, are used to establish a usual deficiency of lithium, as compared with theoretical calculations. This phenomenon is attributed to widespread leaching. It is suggested that in pegmatites there are commonly two generations of spodumene, namely magmatic and metasomatic. Processes of alteration and replacement of spodumene by petalite, quartz, muscovite, potash-feldspar, hydromica, and the clay minerals are discussed.

N. R.

BRADBURY (J. C.). *Barite in the southern Illinois fluorspar district.* Illinois State Geol. Survey, 1959, Circ. no. 265, 20 pp.

Baryte occurs in association with fluorite in the Hardin-Pope County mining district and is found in both the vein and bedded replacement types of fluorite deposits. Its distribution is spotty and concentrations are of possible commercial significance in only a few areas; these are described and suggestions are made for prospecting. Chemical analyses of baryte and baryte 'ores' from various parts of the district are given.

W. A. Wh.

GOSSE (RALPH C.). *Strontianite at Schoharie, New York.* Rocks and Minerals, 1957, **32**, 462-463.

A brief review of the mining history and present status of the strontianite deposit, and directions to the locality are given.

R. S. M.

FRIEDRICH (O. M.). *Zur Genesis der ostalpinen Spatmagnetit-Lagerstätten*. Radex Rundschau, 1959, no. 1, 393-420, 38 figs. (German, French, and English summaries.)

An origin as metasomatized sediments is favoured.

A. G. C.

THIAGARAJAN (R.). [*Talc-magnetite rock near Bhitari Dari, Dhalbhum Subdivision, Singhbhum District, Bihar*. Indian Min., 1958, **12**, 208, 1 table.] Brit. Ceram. Abstr., 1959, abstr. 2070.

The rock contains 35-45% magnetite, 45-55% talc, and 5-12% impurities.

A. G. C.

HOYOS (A.) & DELGADO (M.). *Estudio mineralógico de un talco*. An. Edaf. Fis. Veg., 1958, **17**, 163-172, 6 figs., 1 table.

A sample of talc from the serpentine deposit of the Barranco de San Juan (Granada) proves to be of great purity, structurally well crystallized. The macrocrystals, however, seem to be formed by a disordered association of microcrystals and microplates, as optical study with the petrographic microscope shows.

M. F.-A.

KEGEL (WILHELM). *Geologia do fosfato de Pernambuco*. Divn. Geol. e Min., Dept. Nac. Prod. Mineral., Rio de Janeiro, 1955, Bol. **157**, 54 pp., 10 figs.

The phosphate deposit of Pernambuco state is rich in P_2O_5 in the transgression zone above the continental facies but poorer in P_2O_5 in the zone of marine sedimentation. A chemical analysis is given: SiO_2 13.83, Al_2O_3 5.90, Fe_2O_3 3.40, CaO 3.61, $MgCO_3$ 4.47, $CaCO_3$ 12.83, $Ca_3(PO_4)_2$ 52.33, CaF_2 —, H_2O <110° 3.80, =100-17.

A. B. R.

FRANCO (RUI RIBEIRO). *Sobre os depositos de quartzo do Brasil*. Gemologia, 1957, **7**, 15-20.

A survey of the various localities in different states of Brazil where deposits of quartz are found.

A. B. R.

SMIT (A. F. J.) & LANDEWIJK (J. E. J. M. VAN). *An occurrence of corundum in the Precambrian of Ghana*. Proc. Koninkl. Nederl. Akad. Wetensch., 1959, ser. B, **62**, no. 5, 283-285.

Corundum is found in situ near Nebiewale in northern Ghana. It occurs in lenses of muscovite-gneiss in a sodal-clase leuco-adamellite. The crystals (in size up to two inches) have a grey colour and are opaque to translucent. More details will be published later.

P. C. Z.

OFTEDAHL (CHRISTOFFER). *Oversikt over Grongfeltets skjerp og malmforekomster*. Norges Geol. Unders., 1958, **202**, 75 pp., 1 pl., 12 figs. (Summary: Ore occurrences of the Grong area.)

131 ore deposits in the Grong area—some 200km N.E. of Trondheim—are listed and described. Most of them are

unimportant. 3 large deposits—Joma, Skorovass, Gjer—are described in more detail. The descriptions are based on observations by the late Steinar Foslie supplemented by results from the author's own field work. The ores are largely pyrite ores with varying contents of pyrrhotite, chalcopyrite, zinc blende, etc. A number of chemical analyses and a few trace element determinations are quoted. The mode of formation of the ores is discussed. The author suggests an exhalative-sedimentary origin for both the large and the small deposits of the area.

I. W. C.

POULSEN (ARTH. O.). *Map 1:100,000: Norges gruve- og malmforekomster. II. Nord-Norge*. Norges Geol. Unders., 1958. *List of names to the map*. Norges Geol. Unders., 1959, **204B**, 29 pp. [The description, No. 204A, will be published in the near future.]

826 deposits are listed and plotted on the map. They are classified as: pyrite and Cu; Fe, Ti, Mn; Zn, Pb; Mo, Cr; Au, Ag, As, U; each of these groups has its own symbol on the map. The sizes of the deposits are indicated and mines being worked have special symbols. The name list is in Norwegian and gives the kind of ore for each deposit by chemical symbols [K means pyrite and R means rhodochrosite].

I. W. C.

VISSER (D. J. L.). *The geology and mineral deposits of the Griquatown area, Cape Province*. Geol. Surv. Union of South Africa. Explanation of Sheet 175 (Griquatown), 1958, pp. 1-72, 3 pls.

The mineral deposits include crocidolite, low grade manganese ore, and small amounts of baryte, kieselguhr, and galena. The development of crocidolite shows evidence of structural control. Four analyses of manganese ore illustrate an inversely proportional relationship of Mn and Fe.

M. M.

RUE (EDGARD AUBERT DE LA). *Etude géologique et prospective minière de la Polynésie Française*. Publié par l'Inspection Générale des Mines et de la Géologie, Paris, 1959, pp. 1-43, 13 pls.

The rocks of the volcanoes of French Polynesia (Moorea, Huahine, Raiatea, Tahaa, Bora-Bora, Maupiti, Hiva Oa, Clipperton, Makatea) are of presumed Pliocene-Quaternary age. A mineralization in iron and manganese is of local importance. Phosphate is worked on Makatea. Six analyses include goethite, asbolane, psilomelane, pyrolusite.

E. J. & A.

OBERMULLER (ALPHONSE). *Contribution à l'étude géologique et minérale de l'île Clipperton*. Publié par l'Inspection Générale des Mines et de la Géologie, Paris, 1958, pp. 46-60, 11 pls.

The position of Clipperton Island is 10°18'41" N. 1

12°34' W. Long. according to the astronomical findings for the station in the north-east of the island published by the American mission in 1957. The rock capping the south-east of the island is trachyte [A. Roix, 1939]. A small deposit of tricalcium phosphate formed by reaction of guano on coral does not exceed 1,000 tons reserve. Indications of aluminium phosphate zones of alteration are of no economic interest.

E. J. & A. S.

WITT (D. F.). *Geology of Cardiff and Faraday Townships*. Ann. Rept. Ontario Dept. Mines, 1957, **66**, pt. 3, 82 pp., 14 figs., 4 maps.

This area in the centre of the Haliburton-Bancroft uranium district consists of Grenville metasediments intruded and replaced by diorite, gabbro, syenite, granite, and nepheline syenite. The progressive metamorphism of Grenville sediments and mineral assemblages of phibolite-granulite facies are tabulated and described in detail, with Rosiwal, modal, and chem. analyses. Minerals of economic interest include allanite, apatite, dolomite, leucospar, fluorite, graphite, magnetite, molybdenite, and uranium deposits [Ann. Rept. Ontario Dept. Mines, 1956, pt. 6]. The general geological features of the U deposits are summarized, with brief descriptions of the deposits which occur in pegmatitic dikes, as disseminated metamorphic replacement deposits, and as hydrothermal veins.

J. A. M.

MONS (HENRY H.) & DAVIS (FENELON F.). *California mineral commodities in 1956 and 1957*. California Divn. of Mines, 55th Rept. of the State Mineralogist, 1959, pp. 89-153.

Chromium, copper, iron, lead, silver, and zinc production increased; gold, mercury, wolfram, and manganese production declined. Production of the following structural and industrial minerals increased: baryte, borates, calcium fluoride, diatomite, gypsum, iodine, lime, magnesium compounds, potassium salts, salt, sand and gravel, sodium carbonate, sodium sulfate, and stone. [M.A. 14-28] K. S.

MARK (W. B.) & CARLSON (D. W.). *Mines and mineral resources of El Dorado County, California*. California Journ. Mines & Geol., 1956, **52**, 369-591.

Gold, chromite (the largest known deposit in the Sierra Nevada), copper and zinc sulphides, and several non-metallic minerals comprise the chief economic mineral commodities.

K. S.

SWINEFORD (ADA) & FRYE (JOHN C.). *Petrographic comparison of Pliocene and Pleistocene volcanic ash from western Kansas*. Kansas Geol. Survey, 1946, Bull. **64**, pt. 1, 1-32, 1 pl., 4 figs.

CAREY (J. SHELDON), FRYE (JOHN C.), PLUMMER (NORMAN), & SWINEFORD (ADA). *Kansas volcanic ash resources*. Kansas Geol. Survey, 1952, Bull. **96**, pt. 1, 1-68, 7 pls., 4 figs.

Pleistocene and Pliocene volcanic ash deposits in central and western Kansas consist of relatively pure accumulations of fragments of siliceous volcanic glass and attain thicknesses as great as 30 ft. Typical fresh glass has approx. composition SiO_2 70, Al_2O_3 12, Fe_2O_3 2, $\text{CaO} + \text{MgO} < 3\%$; 54 chem. anal. are given. The percentage of Fe_2O_3 is lower in the Pleistocene ash. Sp. gr. of the Pleistocene ash is lower than that of the Pliocene; refr. ind. of about 1.501 is common to all but two of the 24 deposits tested. Diagnostic characters of shards from Pleistocene samples are numerous elongated vesicles, smaller radius of curvature, and greater abundance of rod-like fragments. All but two samples of Pleistocene ash are believed to represent a single fall; minor differences suggest the occurrence of three falls in the Pliocene. Weathering of the ash produces stages of alteration from cloudiness to bentonite.

J. Ph.

LAMAR (J. E.). *Limestone resources of extreme southern Illinois*. Rept. Invest. Illinois State Geol. Survey, 1959, **211**, 81 pp.

One hundred and eighteen chemical analyses and 40 physical tests of limestone and 58 chemical analyses of clays and shales are given. [M.A. 14-293] W. A. Wh.

YOUNG (ROBERT S.). *Sulfides in Virginia*. Virginia Minerals, 1956, **2**, 1-7, 2 figs.

Districts yielding the sulfides of lead, zinc, iron, copper, cobalt, and nickel are plotted on a map. The history of sulfide mining in Virginia and a selected bibliography are given.

R. S. M.

EXPERIMENTAL MINERALOGY

ALL (H. P.), BROWN (B.), NELSON (D.), & COMPTON (L. A.). I. *An apparatus for use with condensed phases at 10,000°*. II. *Some thermodynamic and rate considerations at very high temperatures*. Journ. Phys. Chem., 1958, **62**, 346-351.

Steel-ringed tungsten carbide pistons hold an internal carbon or SiC heater that can reach 10,000°C for 15 sec. Pressure is guessed at 16,000 atm. Speculation on free energy and rate relations at high temperature and pressure.

W. T. H.

BOVENKERK (H. P.), BUNDY (F. P.), HALL (H. T.), STRONG (H. M.), & WENTORF (R. H., Jr.). *Preparation of diamond*. Nature, 1959, **184**, 1094-1098, 11 figs.

Diamonds have been grown from carbon in the presence of catalysts at pressures ranging from 55-100 kilobars and temperatures ranging from 1200°-2400°C. Catalysts can be Cr, Mn, Ta, the group VIII metals, or those of their compounds which will react to give free metal under the experimental conditions. The transformation occurs across a very thin film which separates the carbon from the diamond. The habit and colour of the diamonds produced vary with temperature of formation. [M.M. 32-185]

C. H. K.

MEDLIN (W. L.). *The preparation of synthetic dolomite*. Amer. Min., 1959, **44**, 979-986, 1 fig.

Dolomite was synthesized from a solution of $MgCl_2$, $CaCl_2$, and urea subjected to a CO_2 pressure of 2-3 atmospheres and a temperature of 200°-250°C. Sodium chloride when present extends the temperature range over which dolomite is precipitated.

A. C. H.

SAALFELD (H.). *Einkristalluntersuchungen zum Problem der Hydrargillit-Entwässerung*. Zeits. Krist., 1959, **112**, 88-96, 2 figs.

Single crystals of hydrargillite were first heated in vacuo at 350°C and then up to 1000°C in air, and the breakdown products $\rho-Al_2O_3$, $\eta-Al_2O_3$ (a 7.80Å), and corundum were examined microscopically and by X-rays. It was found that the crystallites of the products showed definite orientation relationships with the structures involved, allowing conclusions to be drawn concerning the crystal-chemical processes involved in the hydrargillite breakdown.

R. A. H.

DELL (R. M.) & WELLER (S. W.). *The thermal decomposition of nesquehonite $MgCO_3 \cdot 3H_2O$ and magnesium ammonium carbonate $MgCO_3 \cdot (NH_4)_2CO_3 \cdot 4H_2O$* . Trans. Faraday Soc., 1959, **55**, 2203-2220, 9 figs.

The thermal decomposition of nesquehonite has been investigated by thermogravimetric, d.t.a., and petrographic methods. It decomposes first to crystalline $MgCO_3 \cdot H_2O$ and then to an amorphous magnesium carbonate and finally to magnesia. In the presence of steam it undergoes hydrothermal decomposition at 100°C to hydromagnesite. The d.t.a. curves in nitrogen and in CO_2 are figured. [M.A. 5-431]

R. A. H.

HOLMQUIST (S. B.). *Two new complex calcium ferrite phases*. Nature, 1960, **185**, 604.

X-ray powder data are given for two new ternary phases, $4CaO \cdot FeO \cdot 4Fe_2O_3$, and $3CaO \cdot FeO \cdot 7Fe_2O_3$, prepared by heating dicalcium ferrite, hematite, and magnetite in

evacuated silica capsules at 1000°C for 1-10 h. $3CaO \cdot FeO \cdot 7Fe_2O_3$ has a powder pattern similar to that of $CaO \cdot 2Fe_2O_3$ and may be a solid solution between calciferite and magnetite.

D. M.

JOHNSON (W.). *Two synthetic compounds containing chromium in different valency states*. Min. Mag., 1959, **32**, 408-411.

Chromium-bearing apatite- and perovskite-type compounds have been synthesized by sintering mixtures containing CaO and Cr_2O_3 , and CaO , Cr_2O_3 , and Fe_2O_3 respectively. The apatite formed by partial oxidation of Cr_2O_3 and subsequent addition of atmospheric moisture give $Ca_5(CrO_4)_3OH$: it has a 9.67, c 7.01Å, c/a 0.725, space group $P6_3/m$. The perovskite formed as a non-stoichiometric compound, $Ca_4(Fe,Cr)_4O_{11}$, by partial oxidation of the Cr_2O_3 during firing, and has a 5.415, b 5.489, c 7.415, probable space group $Pbnm$. Indexed X-ray powder data are tabulated. [M.A. 13-174]

R. A.

GILLARD (S.) & POTDEVIN (H.). *Étude d'uranates de plomb hydratés synthétiques*. Bull. Soc. roy. Sci. Liège, 1959, **28**, 222-233, 4 figs.

Four uranates of lead — $PbO \cdot 2UO_3 \cdot 1.8H_2O$, $0.93PbO \cdot 2UO_3 \cdot 1.85H_2O$; $0.67PbO \cdot 2UO_3 \cdot 2.53H_2O$; $0.46PbO \cdot 2UO_3 \cdot 2.87H_2O$ — have been synthesized. H_2O content increases linearly with the ratio UO_3/PbO ; so does the density also. The X-ray powder diagrams are sensibly identical. These results may be interpreted as the substitution of hydrogen for lead, leading to solutions the structure type of which is that of uranate.

J.

[KLEVTSOV (P. V.) & LEMMLEIN (G. G.)] Клевцов (П. В.) и Леммлейн (Г. Г.). Определение минимального давления образования кварца на примере кристаллов с PbO . [Determination of the minimum pressure of quartz formation on the example of crystals from the PbO system]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 661-666, 2 figs.

The liquid inclusions in quartz crystals from the PbO - H_2O - $NaCl$ - KCl system with 24% $NaCl$ and 15% KCl . The experiments were carried out at 1400°C at 85-97% infilling. Two specimens of quartz gave minimum pressures and temperatures for healing of cracks at $P \geq 500$ atm, $T \geq 207^\circ C$, and $P \geq 800-1000$ atm, $T \geq 400^\circ C$ respectively.

S. I.

CORWIN (J. F.). *Hydrothermal reactions under critical conditions. V. Reactions between silica and alkaline earth metal salts*. Journ. Phys. Chem., 1959, **62**, 1086-1088.

At 400°C and 340 atm, silica glass deliquesced in acidic oxide solutions to β -cristobalite.

W. T. H.

SARSSON (G. O.). *Hydrothermal reactions between calcium hydroxide and amorphous silica; the reactions between 120 and 160°*. Journ. Phys. Chem., 1958, **62**, 223–228, 4 figs.

For CaO/SiO_2 up to 0.67, phase Z of unknown composition [Assarsson, G. O., Journ. Phys. Chem., 1957, **61**, 3] plus SiO_2 is the stable assemblage below 150°C; rolite plus SiO_2 is stable above 150°C. At proportions 0.37–1.25, tobermorite plus SiO_2 is stable below 150°C, and notlite plus gyrolite above. At higher lime ratios, $2\text{CaO} \cdot \text{SiO}_2 \cdot \text{H}_2\text{O}$ is formed at low temperatures and lebrandite is formed at higher temperatures. Very slow transformations extend the range of the low temperature limits. X-ray powder data are given for all phases.

W. T. H.

AZOUK (R. I.) & MIKHAIL (R. S.). *The hydration of magnesium oxide from the vapor phase*. Journ. Phys. Chem., 1958, **62**, 920–925, 5 figs.

Sorption-desorption isotherms for artificial periclase plus water vapour = brucite are interpreted in terms of a multi-stage process: physical sorption of water vapour by periclase, subsequent diffusion to the inside of the solid, and finally recrystallization to the brucite structure.

W. T. H.

LACKBURN (P. E.). *Oxygen dissociation pressures over uranium oxides*. Journ. Phys. Chem., 1958, **62**, 897–902.

Confirmation of earlier determinations that U_4O_9 and U_3O_8 are stable phases in the system U–O. Above 300°C the UO_2 structure increases in oxygen content until it is nearly equal to that of U_4O_9 at 1100°C.

W. T. H.

YLLIE (P. J.) & TUTTLE (O. F.). *Effect of carbon dioxide on the melting of granite and feldspars*. Amer. Journ. Sci., 1959, **257**, 648–655, 2 figs.

Experiments show that CO_2 under pressure has little or no effect on the rates of melting or crystallization of granite and alkali feldspars, and the melting temperatures are unaffected except as pressure *per se* raises the temperature of melting. The melting temperature of granite in the presence of a mixture of CO_2 and water vapour at a fixed total pressure is raised if the proportion of CO_2 is increased.

A. P.

MARK (S. G.) & HOLT (P. F.). *Dissolution of chrysotile asbestos in water, acid, and alkali*. Nature, 1960, **185**, 237.

After some days in the presence of chrysotile, water at 25°C contains an excess of Mg over orthosilicic acid in solution. At 85–90°C the Si–O sheets break down to give increased orthosilicic acid concentration in solution. 0.1N NaOH forms a protective coating of hydrated Mg ions on the surface of the fibres. The protective layer is removed by acid, and further NaOH extraction leads to solution of the next Si–O layer; chrysotile is particularly soluble therefore under alternating acid and alkaline conditions.

D. McK.

FREDERICKSON (A. F.) & COX (J. E., Jr.). *The decomposition products of anorthite attacked by pure water at elevated temperature and pressure*. Proc. 2nd Conf. Clays & Clay Mins., Nat. Acad. Sci., Nat. Res. Council, Publ. 327, Washington, 1954, 111–119, 2 figs.

The solubility of anorthite was measured at 300 bars pressure between 200° and 350°C. Anorthite partially dissolves, and also disintegrates by shedding small particles of crystalline water. Afwillite and xonotlite develop at higher temperatures and their stability is determined by the CaO/SiO_2 ratio of the solution. At 300°C fragments of anorthite and afwillite react with the 'solution' to produce xonotlite.

D. C.

CHRISTIE (O. H. J.). *Crystallization experiments with alkali olivine basaltic glass from Egersund*. Norsk Geol. Tidsskr., 1959, **39**, 271–273, 1 fig.

Glass from the contact zones of alkali olivine basaltic dyke rock was heated both dry and under controlled water pressure. Chemical composition and mol norm are given for the glass and for the glass used by Yoder and Tilley [Ann. Rept. of the Dir. Geophys. Lab. Washington, 1955–56, p. 169]. Experimental details are given. Plagioclase formed in all runs; magnetite or hematite was mostly present; pyroxene formed as a stable phase in some runs; quartz formed metastably in some. Examination of the glassy selvages showed that plagioclase and pyroxene had formed simultaneously under the *PT* conditions existing during the intrusion of the rock. A diagram is constructed and it is shown that the temperature of the intruding melt was between 700 and 1000°C at water pressures less than 2500 bars.

K. S. H.

VOLDÁN (J.). *Zákonitosti rekrytalizace tavených hornin* [Recrystallization regularities of melted rocks]. Silikáty, 1959, **3**, 97–103, 12 microphotos.

Crystallization of artificial rock glasses obtained by melting of 27 basaltic rocks (9 olivine basalts, 5 basanites, 6 olivine nephelinites and nephelinites, 3 tephrites, 2 leucitites, 1 common basalt, 1 olivine melilitite) and 11 non-basaltic rocks (2 andesites, 2 melaphyres, 2 diabases, 2

porphyrites, 2 amphibolites, and 1 spilite) were studied. The content of SiO_2 in the 38 rocks varies from 38.5 to 56.5%. The recrystallization took place in a platinum crucible in an electric gradient oven between the temperatures 1300°C to 600°C during 24 hours. The newly formed phases were examined under the polarizing microscope and by X-rays. During devitrification of the rock glasses the following minerals crystallized: magnetite 1300–600°C; plagioclase in medium acid rocks 1220–950°C, in basaltic rocks 1150–1000°C; olivine in rocks rich in olivine 1300–900°C, in rocks poor in olivine 1150–950°C; monoclinic pyroxene 1150–900°C; orthorhombic pyroxene 1100–800°C; monoclinic hornblende 1140–1000°C; melilite below 1000°C. In some more acid rocks also hematite crystallized. The recrystallized rocks contain a smaller number of minerals than the natural rocks.

J. K.

RAO (S. V. LAKSHMI NARAYANA). *Low temperature alkali feldspar series*. Norsk Geol. Tidsskr., 1959, **39**, 275–286, 3 figs.

Mixtures of microcline and low albite containing different proportions of the two feldspars have been heated at 1025°C and the shift of the 20 $\bar{1}$ lines has been used to evaluate the extent of homogenization. It has been assumed that during the short period of heating (96 hrs) no appreciable disorder of Al–Si sets in, and on this assumption, a tentative subsolidus diagram for the microcline–low albite system is proposed. Natural orthoclase perthites have been heated at 1025°C for different intervals of time and the extent of homogenization has been studied as a function of time using the 131 doublet separation value as an index. It has been found that no homogenization takes place for the first two hours, after which homogenization becomes rapid, and after 8 hours it is practically complete.

K. S. H.

HOCART (R.), VINCENT (E.), & PICARD (N.). *Croissance épitaxiale de ClNa sur NO_3Na au cours d'une cristallisation fractionnée, par évaporation isotherme*. Bull. Soc. franç. Min. Crist., 1959, **82**, 398–399, 2 figs.

R. A. H.

[STARIK (I. E.), KURBATOV (V. V.), & LITVINA (L. A.)] Старик (И. Е.), Курбатов (В. В.) и Литвина (Л. А.). О влиянии нагрева на структуру слюд и микроклина и о сохранении в них аргона [On the influence of heating on the structure of micas and microcline and the conservation of argon in them]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 724–728.

Data are provided for biotite, muscovite, and microcline. It is concluded that the micas on heating part with argon more easily than microcline, because on heating in a high

vacuum, the crystalline structures of the micas and their parameters are greatly changed. Above 'critical' temperatures micas form crystalline substances, while microcline forms an amorphous substance.

S. I. T.

WYART (J.), SABATIER (G.), CURIEN (H.), DUCHEYLAUD (G.), & SÉVERIN (M.). *Échanges isotopiques des atomes d'oxygène dans les silicates*. Bull. Soc. franç. Min. Crist., 1959, **82**, 387–389.

The isotopic exchange of oxygen between silicates and granite and water enriched in ^{18}O has been studied experimentally at 360° to 800°C under pressures of 500 to 1800 bars. The amount of exchange taking place was significant and was considerably enhanced by fusion of the specimens. This is considered to support the hypothesis of a reaction between water and tectosilicates in which the H^+ and OH^- ions break the bonds between Si–O–Si and Al–O–Si.

R. A. H.

FISCHMEISTER (H.) & DROTT (J.). *Reaction rate and growth forms of reaction product in the system $\text{Ag-H}_2\text{S}$* . Acta Metallurgica, 1959, **7**, 777–781, 6 figs.

The reactions at room temperature between silver and H_2S occur in three stages, each characterized by a different growth form of the reaction product. The growth form exerts a large influence upon the reaction kinetics.

R. G. Wils.

KELLOGG (H. H.) & BASU (S. K.). *Thermodynamic properties of the system Pb-S-O to 1100 K*. Trans. Metallurgical Soc. A.I.M.E., 1960, **218**, 70–81, 3 figs., 2 tables.

Five univariant equilibria in the system Pb-S-O were determined by measurement of the equilibrium pressure of SO_2 in the temperature range 800° to 1100°K. Thermodynamic chemical relations were employed to calculate the additional univariant equilibria, and to construct a consistent thermodynamic phase diagram for the system. The heat and free energy of formation of the compounds PbSO_4 , PbO , $\text{PbSO}_4 \cdot 2\text{PbO}$, and $\text{PbSO}_4 \cdot 4\text{PbO}$ at 298.16° were determined from the data.

R. G. Wils.

HAHN (W. C., Jr.) & MUAN (ARNULF). *Studies in the system Mn-O : The Mn_2O_3 – Mn_3O_4 and Mn_3O_4 – MnO equilibria*. Amer. Journ. Sci., 1960, **258**, 66–78, 2 figs.

Equilibrium studies in the intervals 845 to 1029°C and 1248 to 1562°C, with partial pressures of O_2 from 0.21 to $10^{-3.66}$ atm, and from $10^{-3.66}$ to 0.21 atm, show that conditions of stable coexistence of two phases are expressed by $\log p(\text{O}_2) = 8.05 - 10100/T$ for Mn_2O_3 , Mn_3O_4 and $\log p(\text{O}_2) = 13.31 - 26000/T$ for Mn_3O_4 , MnO . Previous work yielded different results.

H. W.

AMAKI (SHIGER) & ROY (RUSTUM). *Revised equilibrium diagram for the system Al_2O_3 - SiO_2* . *Nature*, 1959, **184**, 631-632, 1 fig.

A brief summary of data from some 700 runs in a re-mineration of the Al_2O_3 - SiO_2 - H_2O system by standard 'enching' methods. A full account is to appear in the *J. Amer. Ceram. Soc.* C. H. K.

KELOW (D. A.) & DERGE (G.). *Electrochemical characteristics of FeO - MnO - SiO_2 melts*. *Trans. Metallurgical Soc. A.I.M.E.*, 1960, **218**, 136-140, 4 figs., 1 table.

The properties of the FeO - MnO - SiO_2 system were studied by current efficiency measurements of melts contained in an iron crucible. Iron electrodes were used and current efficiency was determined from the amount of periodic dissolution. In all melts, the efficiency was less than 100% and this deviation is attributed to the presence of positive hole conduction. Both the positive hole and ionic conductivities were found to decrease in magnitude with increasing MnO and SiO_2 concentration. The only metal deposited in the cathode reaction was iron.

R. G. Wls.

ACHILLE (FRANK) & ROY (RUSTUM). *High pressure studies of the system Mg_2GeO_4 - Mg_2SiO_4 with special reference to the olivine-spinel transition*. *Amer. Journ. Sci.*, 1960, **258**, 225-246.

Records of about 120 hydrothermal runs record the effects of temperatures up to 1000°C, and pressures up to 10,000 lb/in², on many compositions in the system and several with .10 to .20 of the Mg replaced by Fe . The reversible-inversion temperature for Mg_2GeO_4 spinel-olivine equilibrium is 810°C at 1 atm pressure; ΔV of inversion 3.5 cc/mole; ΔH 3690(±)180 cal/mole. The inversion temperature increases 0.025°C/bar for the first 500 bars. Infrared absorption spectra, X-ray diffraction intensities (indexed powder patterns given), and molar refractivities ($n=1.768$) clearly show that Mg_2GeO_4 has the 'inverse spinel' structure. Solid solution $Mg_2(Ge_{1-x}Si_x)O_4$ is complete in olivine phase above the inversion temperature for $x=0$. Maximum x for spinel solid solutions at lower temperatures increases from .10 at 700 bars to .50 at 10,000 bars and 542°C. Extrapolated P is 100,000±15,000 bars for spinel-olivine transition in Mg_2SiO_4 . Lattice constant $a=8.255\text{\AA}$ for $x=0$; it increases linearly to $x=0.50$; an extrapolated value for $x=1.00$ is 8.22Å; ΔV for spinel-olivine transition is estimated by extrapolation as 2.0 cc/mole, and pressure dependence of the transition as 0.13°C/bar. Substitution of Fe for Mg increases the maximum x for given P - T conditions. An olivine-spinel transition is therefore postulated in the earth's mantle to explain seismic and density discontinuities starting at about 100 km depth.

H. W.

HEMLEY (J. JULIAN). *Some mineralogical equilibria in the system K_2O - Al_2O_3 - SiO_2 - H_2O* . *Amer. Journ. Sci.*, 1960, **258**, 153.

Corrections for errata in *Amer. Journ. Sci.*, **257**, 259 & 266. [M.A. 14-335] H. W.

BUCKNER (DEAN A.), ROY (DELLA M.), & ROY (RUSTUM). *Studies in the system CaO - Al_2O_3 - SiO_2 - H_2O , II: The system $CaSiO_3$ - H_2O* . *Amer. Journ. Sci.*, 1960, **258**, 132-147, 3 figs.

The upper stability limit of xonotlite is about 420°C at 20,000 lb/in², but 500° in the presence of 7.5% (weight) of $SrSiO_3$. This limit is raised about 20° per 10,000 lb/in² increase, within the range from 5000 to 30,000 lb/in². Tobermorite decomposes to xonotlite+water at about 290°, almost independent of pressure within the range 10,000 to 30,000 lb/in², in some cases with the formation of an intermediate phase 'B' (probably scawtite) in a temperature interval of about 50°. Truscottite [=reyerite], gyrolite, scawtite, and wollastonites were formed in one or more hydrothermal runs. H. W.

GELLER (S.) & MILLER (C. E.). *Silicate garnet-yttrium-iron garnet solid solutions*. *Amer. Min.*, 1959, **44**, 1115-1120, 3 figs., 2 tables.

In the system grossular-yttrium-iron garnet [$Ca_3Al_2(SiO_4)_3$ - $Y_3Fe_2(FeO_4)_3$] solid solutions exist over the range 10-100% $Y_3Fe_2(FeO_4)_3$. Lattice constants of intermediates are $\frac{1}{2}$ to 1% greater than those expected from the linear composition/lattice constant law. In the system $Mn_3Al_2(SiO_4)_3$ - $Y_3Fe_2(FeO_4)_3$ solid solution exists only in the 5, 10, and 90 mole % $Y_3Fe_2(FeO_4)_3$ compositions, with similar non-linearity of lattice constants. Specimens were prepared by sintering cold pressed mixed oxides to 1350-1400°C: glass phases devitrified on annealing at 1150°C, crystalline phases became one phase on repeated grinding, compaction, and sintering. B. H. B.

FYFE (W. S.) & VALPY (G. W.). *The analcime-jadeite phase boundary: Some indirect deductions*. *Amer. Journ. Sci.*, 1959, **257**, 316-320, 1 fig.

This boundary has been recalculated thermodynamically using free energies obtained from other phase boundaries, and estimates of entropies. The pressure at which analcime decomposes to jadeite, as measured by Griggs and Kennedy, [M.A. 13-251] is not inconsistent with the thermodynamic calculation at 600°C. But at 25°C, where the thermodynamic calculation gives a negative slope, Griggs and Kennedy's extrapolated curve is at least twice too high.

W. T. H.

GEMSTONES

FRANCO (RUI RIBEIRO). *Pequeno glossário gemológico*. Gemologia, 1959, **4**, 17-38. (In Portuguese.)

The glossary lists the names of 180 gem minerals and varieties, and gives the distinguishing properties under the main mineral species or group. J. Ph.

KNIGHT (O. LEM.). *Faceted gemstones—cutting for maximum brilliance*. Journ. Gemmology, 1960, **7**, 167-177, 5 figs.

The theoretical ideal proportions for the brilliant type of cut are listed for 16 gemstones and the basis on which the ideal proportions have been calculated is explained. Some reference is also made to the step- or emerald-cut.

R. A. H.

[ORLOV (YU. L.)] Орлов (Ю. Л.). Сингенетические и эпигенетические включения в кристаллах алмаза [*Syngenetic and epigenetic inclusions in the crystals of diamonds*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 103-120, 7 figs.

Optical and X-ray data are provided for the following minerals found as inclusions in diamonds: olivine, garnet, chrome-spinel, diamond, graphite, serpentine, quartz, hydroxides of iron, zircon, and others. S. I. T.

ANDERSON (B. W.). *Luminescence of a large pink diamond*. Journ. Gemmology, 1960, **7**, 216-220, 1 fig.

A 34.64 carat pink diamond, recently sold for £46,000, showed a strong orange-yellow fluorescent glow under ultra-violet or X-rays. After such exposure there was a persistent phosphorescence of the same colour. A clearly defined line in the yellow at 5750 Å was observed spectroscopically. The density of this diamond is 3.517.

R. A. H.

BRILL (R.) & BARTH (H.). *Intensity of the (111) reflexion for diamond*. Nature, 1959, **184**, 264.

A recalculation of the F-value using an absorption coefficient determined from the specimen gives a value which is not in agreement with the theoretical value [M.A. 14-264]. This is attributed to the accumulation of binding electrons between two carbon atoms. Details and a fuller discussion are to be published later. C. H. K.

TOLANSKY (S.) & SUNAGAWA (I.). *Spiral and other growth forms of synthetic diamonds: a distinction between natural and synthetic diamonds*. Nature, 1959, **184**, 1526-1527, 6 figs.

Phase-contrast microscopy has revealed that synthetic diamonds may have highly perfect, smooth cube faces or cube faces showing growth spirals. The habit of others may

be dendritic. Such observations have not been made on natural diamonds and may be characteristic of synthetic diamonds which are grown rapidly and which may contain metal carbide impurities. C. H. K.

TOLANSKY (S.) & SUNAGAWA (I.). *Interferometric studies of synthetic diamonds*. Nature, 1960, **185**, 203-204, 8 figs.

Crystal defects or surface films lower the reflectivity of synthetic diamonds and increase the visibility of fringe systems obtained with two-beam interferometry. Crystal faces are in general exceptionally smooth with occasional small hillocks which may be growth spirals. Octahedral faces frequently have a hopper character with their outer rims smooth and of good quality. Fringe displacements at the termination of crystallographically oriented slip lines show that the slip step has the character of a screw dislocation. Dendritic crystals are smooth and more or less co-planar. The presence of well defined linear trigonal features indicate that these are growth phenomena. C. H. K.

RAAL (F. A.). *Alleged formation of an intermediate diamond structure on heating diamond*. Nature, 1960, **185**, 218-219.

The extra X-ray and electron diffraction rings and spots observed by Seal [Nature, 1958, **182**, 1264] in heated diamond powders are due to silicon carbide formed by reaction with impurities. Silicon carbide is also formed when diamond powders are heated in fireclay boats at 1400°C. D. McK.

SEAL (M.). *Graphitization of diamond*. Nature, 1960, **182**, 522-523.

The extra X-ray and electron diffraction rings and spots in partially graphitized diamond, attributed by Seal [Nature, 1958, **182**, 1264] to an intermediate carbon structure, are shown to be due to silicon carbide and other impurities. The original specimen contained 1% Si. No extra reflexions were found when the experiments were repeated with a diamond containing 0.0002% Si. D. McK.

CHAMPION (F. C.). *Diamonds*. Sci. Progress, 1957, **44**, 447-461.

A description of optical, fluorescent, electrical conduction, and etch differences between different diamonds and of the results of irradiating them in various ways. The differences are ascribed to defects in the lattice and/or the presence of foreign atoms, and a classification on this basis is proposed. Semi-conducting properties are examined in more detail and comparisons are made with other diamond type crystals. No experimental details are given. [M.A. 14-64] M. H. B.

LLANDER (H.). *Strontium titanates examined under a microscope*. Journ. Gemmology, 1960, **7**, 211–215, 8 figs.

Details are described and illustrated by which strontium titanate may be distinguished from diamond. Faint scratches may be seen on most facets, inexact cutting gives an irregular culet and rounded facet edges, and 'centipede-like' inclusions are typical.

R. A. H.

LANDARINO (JOSEPH A.). *Refraction, absorption and bi-absorption in synthetic ruby*. Amer. Min., 1959, **44**, 961–973, 6 figs.

One specimen, coloured pink by 0.11% Cr_2O_3 , gave refr. ind. from ω 1.7761, ϵ 1.7677 at 480 $\text{m}\mu$ to ω 1.7635, ϵ 1.7554 at 700 $\text{m}\mu$. Maximum absorption coefficients are ω 34.9×10^{-6} at 560 $\text{m}\mu$, k_ϵ 25.4×10^{-6} at 550 $\text{m}\mu$. A deep red specimen containing 1.40% Cr_2O_3 gave ω 1.7821, ϵ 1.7741 at 480 $\text{m}\mu$, ω 1.7696, ϵ 1.7614 at 700 $\text{m}\mu$ and maximum absorption coefficients $k_\omega = 311 \times 10^{-6}$ at 560 $\text{m}\mu$, $k_\epsilon = 138.2 \times 10^{-6}$ at 550 $\text{m}\mu$. The maximum negative ($k_\epsilon < k_\omega$) value of biabsorption occurs at 570 $\text{m}\mu$ for both specimens. [M.A. 13–458]

A. C. H.

ALEXANDER (A. E.). *The Chatham ruby makes its bow*. Gemmologist, 1959, **28**, 201–204.

Ruby is produced in the laboratories of Carroll Chatham for commercial purposes. By use of a seed of natural material stones are grown from a saturated solution. The refractive indices are within the range 1.76–1.77. The stones contain inclusions similar to those met with in natural stones and wisp-like inclusions, similar to those found in the emeralds produced in Chatham's laboratories [M.A. 8–269, 270, 9–51, 14–119], have been observed. All stones examined fluoresced but not all phosphoresced.

G. F. A.

EPPLER (W. F.). *A Brazilian emerald*. Journ. Gemmology, 1960, **7**, 221–225, 5 figs.

A crystal of emerald from Bom Jesus das Meiras, Bahia,

Brazil, examined under a microscope with nearly closed aperture and an intense light beam, showed growth phenomena indicating intermittent growth. Brush-like liquid inclusions occur in the outer rim of the crystal.

R. A. H.

EPPLER (W. F.). *An unusual star-beryl*. Journ. Gemmology, 1960, **7**, 183–191, 15 figs.

A greenish translucent to nearly opaque beryl with sp. gr. 2.682, ϵ 1.564, ω 1.569, exhibits asterism. The inclusions present are tabular, very thin crystals of pyrrhotine, which are the cause of the star effect, crystal groups of quartz and epidote, rod-like apatite, and clusters of pyrite. [M.A. 14–41]

R. A. H.

WEBSTER (R.). *The prized chrysoberyls*. Gemmologist, 1959, **28**, 190–194, 2 illus.

A general description of the gem mineral chrysoberyl.

G. F. A.

SMITH (W. E.). *The nature of chalcedony*. Gemmologist, 1960, **29**, 5–7 & 16.

The refractive index and density of chalcedony are compared with those of opal and quartz. It is considered that the description of chalcedony as a form of silica distinct from quartz, or as a mixture of colloidal silica, is not tenable. The lower refractive index and density of chalcedony relative to quartz are said to be due to minute spherical pores, which are probably filled with dilute saline solution.

G. F. A.

RUFF (ELSIE). *Jade story—American* (3). Journ. Gemmology, 1960, **7**, 236–246, 4 figs.

The Tribute Rolls which list the districts expected to provide jade as tax have been of great use in extending our knowledge of Central American jade. The use of jade as a filling for teeth has been recorded from British Honduras: other minerals so used include pyrite, turquoise, and hematite. [M.A. 14–40, 265, 408]

R. A. H.

GEOCHEMISTRY

ABELSON (PHILIP H.), editor. *Researches in geochemistry*. New York (Wiley), 1959, 127 figs., x+511 pp., 3 pls., 73 tables. Price 88s.

Twenty-three papers presented at a series of seminars in geochemistry, held at the Geophysical Laboratory and the Johns Hopkins University during 1957–1958, are collected in this book [M.A. 14–241; reviewed M.M. 32–585, by E. A. Vincent]:

Pp. 1–24. ARRHENIUS (GUSTAF O. S.). *Sedimentation on the ocean floor*. 11 figs.

Discussion of the geological record of sedimentation in the ocean and the chronology of oceanic sediments based on a consideration of components of lithogenous, hydrogenous, biogenous, and cosmogenous derivation.

Pp. 25–37. GARRELS (ROBERT M.). *Rates of geochemical reactions at low temperatures and pressures*. 1 fig.

Studies of rates and mechanisms of selected reactions lead to the conclusion that feldspars and clay minerals persist metastably. An attempt is made to classify reaction types and to express them in terms of those likely to result

in reaction rates so slow as to be of importance in maintaining metastability of geologically significant duration.

- Pp. 38-61. KEITH (M. L.) & DEGENS (E. T.). *Geochemical indicators of marine and fresh-water sediments*. 5 figs.

Trace-element analyses of sedimentary rocks may provide criteria for distinguishing those of marine and of fresh-water origin. In a series of Pennsylvanian shales the fresh-water members show consistently lower Li and B than the marine members. The general utility of such a relation as a criterion for rocks of other ages or areas remains to be demonstrated.

- Pp. 62-78. HAWKES (H. E.). *Geochemical prospecting*. 3 figs.

A discussion of the problems of using primary and secondary geochemical anomalies in prospecting. [M.A. 14-41]

- Pp. 79-103. ABELSON (PHILIP H.). *Geochemistry of organic substances*. 4 figs.

A summary of information on the fate of organic substances in geological environments, giving consideration to the thermal stability of organic compounds, reactions with other molecules, and the distribution of various types of organic compounds in different geological materials.

- Pp. 104-117. HANSON (WILLIAM E.). *Some chemical aspects of petroleum genesis*. 4 figs.

A discussion of the problems involved in obtaining an understanding of the transformation of organic material into petroleum under geological conditions.

- Pp. 118-150. MILTON (CHARLES) & EUGSTER (HANS P.). *Mineral assemblages of the Green River formation*. 9 figs., 3 pls.

The largely lacustrine Green River formation (early and middle Eocene), of Wyoming, Colorado, and Utah, produces a large amount of soda and also is the world's largest known reserve of hydrocarbons. Associated with the lacustrine evaporite deposits there is an amazing number and variety of authigenic minerals, including 17 carbonates, 13 or more silicates and borosilicates, and several sulfides, phosphates, and sulfates. New minerals described from the formation and not known elsewhere include the carbonates shortite, eitelite, and bradleyite, the borosilicates reed-mergnerite and garrelsite, and the silicate loughlinite. The associations and probable conditions of formation of all of the characteristic mineral components are discussed at length with special emphasis on the effects of temperature and CO₂ pressure on the various combinations of carbonates. This is the first comprehensive mineralogical description of a unique deposit of great practical importance and geological interest.

- Pp. 151-168. LIBBY (W. F.). *Tritium in hydrology and meteorology*. 5 figs.

- Pp. 169-189. DE VRIES (HESSEL). *Measurement and use of natural radiocarbon*. 6 figs.

- Pp. 190-216. TILTON (G. R.) & DAVIS (G. L.). *Geochronology*. 3 figs.

The various methods for age determination based on natural radioactivity and their results are critically evaluated. No justification exists for accepting any single method as establishing the absolute age of a mineral rock; cross checking by two or more independent methods is required to define ages with any degree of certainty.

- Pp. 217-240. EPSTEIN (SAMUEL). *The variations of the O¹⁸/O¹⁶ ratio in nature and some geologic implications*. 4 figs.

A review of recent work on the ¹⁸O/¹⁶O ratio, including work on minerals and rocks and on coexisting pairs of minerals. In coexisting quartz and dolomite the ratios are nearly identical. In coexisting quartz and calcite they are invariably lower in quartz but vary together. There is some indication that the ratio in magnetite may reflect directly the ratio in the parent solutions.

- Pp. 241-259. AULT (WAYNE U.). *Isotopic fractionation of sulfur in geochemical processes*. 5 figs.

Data on the ³²S/³⁴S ratio in natural sulfur, sulfides, and sulfates from many types of deposits are summarized. It is shown that, though the ratio may vary in specimens from different deposits, or even within a single crystal, there is a characteristic range of variation for sulfur of each particular type of origin. The lowest values, about 20.83 to 21.96, are found in sulfates from the calcite cap rock of Gulf Coast sea domes; the highest, up to 23.2, in sulfides of sedimentary origin.

- Pp. 260-278. KRAUSKOPF (KONRAD B.). *The use of equilibrium calculations in finding the composition of a magmatic gas phase*.

Possible equilibrium composition of a magmatic gas phase at 600°C, assuming a total H₂O pressure of 1000 atm and 4 different specified oxygen pressures, are calculated in terms of partial pressures for a dozen constituents from thermochemical data. This is followed by a consideration of the volatilities of metals and metal compounds in equilibrium with solid sulfides, silicates, and oxides at 600°C. Results are summarized in two tables of exemplary clarity. [See following abstract; M.A. 14-157, 180].

- Pp. 279-300. BARTON (PAUL B., Jr.). *The chemical environment of ore deposition and the problem of low temperature ore transport*. 4 figs.

A brief summary is given of information from three sources on the chemical environment of ore deposition and the composition of thermal springs and fumaroles, the

ture of fluid inclusions, and phase relations. The possibility that complex formation may increase the solubility of some metals by many orders of magnitude is considered. [See also Barton, P. B., Jr., *Econ. Geol.*, 1957, **52**, 333-353.]

p. 301-335. KULLERUD (GUNNAR). *Sulfide systems as geological thermometers*. 13 figs.

Data on phase relations in sulfide systems, with special emphasis on the systems Cu-Fe-S, Fe-S-O and FeS-ZnS [A. 12-387], are summarized and evaluated for their use in geological thermometry. It is concluded that information from synthetic sulfide systems, when properly applied, can lead to reliable inferences about conditions during formation of sulfide ores.

p. 336-358. GOLDSMITH (JULIAN R.). *Some aspects of the geochemistry of carbonates*. 4 figs.

A convenient summary of the extensive studies by the author and his co-workers on the relations of the natural carbonates of divalent ions. [M.A. 13-270, 446, 478-9, 1959, 14-178]

p. 359-376. CHAYES (FELIX). *Diffraction effects of short-range ordering in layered sequences*. 5 figs.

By means of an optical diffractometer diffraction patterns are obtained from diffraction masks designed to show various relations of ordering or disordering. There is a possibility that effects similar to those described may persist in diffraction patterns from mineral crystals.

p. 377-396. BOYD (FRANCIS R.). *Hydrothermal investigation of amphiboles*. 8 figs.

Hydrothermal investigations on amphiboles have been carried out to provide data on the upper boundary of the amphibolite facies. The stability fields of tremolite, actinolite, and magnesian riebeckite have been determined, and *P-T* diagrams showing the stability fields for these amphiboles are presented.

p. 397-426. EUGSTER (HANS P.). *Reduction and oxidation in metamorphism*.

P-T-X relations in the system Fe-O and in a portion of the system Fe-Si-O are summarized and the effects of the presence of water considered. The temperature at which redox reactions proceed depends largely on oxygen pressure. Rocks containing both the reduced and oxidized members of a redox reaction, such as magnetite+hematite, magnetite+fayalite+quartz, have a fixed oxygen pressure at any temperature. The geological implications are outlined.

p. 427-457. THOMPSON (JAMES B., Jr.). *Local equilibrium in metasomatic processes*. 12 figs.

A graphical method is used to show the boundaries between phase assemblages arising due to tendency towards the establishing of local equilibrium in the system MgO-SiO₂.

The extension of similar considerations to multicomponent systems is briefly considered and Korzhinsky's manner of dealing with metasomatic processes critically discussed. The usual list of references is followed by a list of 21 publications by Korzhinsky from 1941 onward dealing with this subject. [M.A. 12-615, 14-89]

Pp. 458-475. REED (GEORGE W.). *Activation analysis applied to geochemical problems*. 2 figs.

The radioactivation technique, requiring a neutron source, can be very useful in measuring trace-element contents because of its great sensitivity and freedom from contamination. Application to the determination of the U content of meteorites is summarized. [M.A. 14-49]

Pp. 476-494. MACDONALD (GORDON J. F.). *Chondrites and the chemical composition of the earth*.

New evidence supports the idea that the earth may have a composition similar to that of chondritic meteorites. Some consequences of such an hypothesis are examined.

Pp. 495-511. CLARK (SYDNEY P., Jr.). *Equations of state and polymorphism at high pressures*. 6 figs.

Two approaches to equations of state of solids are considered; the thermodynamic approach, exemplified by the Birch-Murnaghan equation, and the Thomas-Fermi statistical model for which the low-pressure limit of applicability is poorly defined. [M.A. 13-341, 612; and following abstract]

A. P.

KAPUSTINSKY (A. F.). *A geochemical hypothesis of the earth's structure*. *Nature*, 1957, **180**, 1245-1246.

The Earth can be divided into three zones. At the lower boundary of the 'perisphere' which corresponds to the Mohorovičić discontinuity, the pressure is such that the outer electrons of the atoms are forced into lower quantum levels. This 'intersphere' goes down to a depth of 2900 km. At the centre of the Earth is the centrisphere where the pressure is so high that matter consists of atomic nuclei immersed in a homogeneous electronic 'plasma'.

C. H. K.

CARRITT (D. E.) & CARPENTER (J. H.). *The composition of sea water and the salinity-chlorinity-density problem*. Nat. Res. Council, Washington, 1959, Publ. 600, 67-86, 3 figs.

Possible variations are considered in the composition of sea water, from the standard of the Knudsen Hydrographical Tables (1901). The later measurements of salinity by Thompson and Wirth were of wider geographical distribution, and are significantly different from the tables. The specific gravity-chlorinity-salinity relationships are of limited precision.

W. T. H.

LYMAN (J.). *Chemical considerations*. Nat. Res. Council, Washington, 1959, Publ. 600, 87-97.

Differences in ionic ratios among the oceans are probably significant because of their different river inflows, although a critical evaluation is not possible at this time. Variation of alkalinity and nutrient ions with depth are given. Further discussion of chlorinity-salinity-density relationships [preceding abstract].

W. T. H.

REDFIELD (A. C.). *Biological considerations—the fourth phase.* Nat. Res. Council, Washington, 1959, Publ. 600, 101–112.

The usual chemical description of sea water is supplemented by description of the ratios of C, N, and P in the biological phase. The ratios of concentration in organic matter and in the sea water itself are 10^5 for P and N, 10^4 for C, and 10^1 for K and Ca; the effects of these on the total concentration in sea water are 1, 10^{-1} , and 10^{-4} , respectively.

W. T. H.

ECKART (C.). *On the need for a revision of the equation of state of sea water.* Nat. Res. Council, Washington, 1959, Publ. 600, 156–165, 4 figs.

A re-presentation of his previous data with consideration of the effect that the present imprecision of the equation of state has on oceanographic calculations. [M.A. 14–347]

W. T. H.

KRAUSKOPF (KONRAD B.). *Factors controlling the concentrations of thirteen rare metals in sea-water.* Geochim. Cosmochim. Acta, 1956, 9, 1–32B.

The following factors controlling the concentration of thirteen metals (Zn, Cu, Pb, Bi, Cd, Ni, Co, Hg, Ag, Cr, Mo, W, V) in sea-water were studied: (1) precipitation of insoluble compounds with ions normally present in aerated sea-water, (2) precipitation of sulphides locally in reducing environments, (3) adsorption by ferrous sulphide, hydrated ferric oxide, hydrated manganese oxide, apatite, clay, and organic matter. Both calculations based on solubility data and precipitation and adsorption experiments were carried out. The principal conclusions are: (1) Sea-water is greatly undersaturated with respect to all thirteen metals. (2) Local precipitation of sulphides is a possible control mechanism for seven of the elements (Cu, Zn, Hg, Ag, Cd, Bi, Pb), but is probably not the chief control, because the concentrations are unrelated to sulphide solubilities. (3) Adsorption is a possible mechanism for all elements except V, W, Ni, Co, and Cr.

A. P.

KRAUSKOPF (KONRAD B.). *The solubility of gold.* Econ. Geol., 1951, 46, 858–870.

The solubilities of gold in various solutions as calculated from electrode potential and free energy data agree well

with experimental results reported in the literature. naturally-occurring alkaline solutions gold is not significantly soluble unless sulfide is present. The effect of temperature on the solubility of gold cannot be predicted from available thermodynamic data.

A. P.

KRAUSKOPF (KONRAD B.). *Separation of manganese from iron in sedimentary processes.* Geochim. Cosmochim. Acta, 1957, 12, 61–84, 4 figs.

Iron compounds to be expected in nature are uniformly less soluble than the corresponding manganese compounds and the ferrous ion is more easily oxidized than manganous ion under any naturally occurring pH-Eh conditions. Oxidation of manganous and ferrous ions by atmospheric oxygen takes place by slow reactions which can be used as an energy source by bacteria. Selective oxidation and precipitation by different species of bacteria can lead to partial separation of the metals but this is probably not a major factor. Experiments were carried out on the selective dissolution of the metals from igneous rocks, using basalt and andesite as a source material, and on selective precipitation. The application to relations in nature is discussed. [M.A. 14–33]

A. P.

DEGENS (EGON T.). *Die Diagenese und ihre Auswirkung auf den Chemismus von Sedimenten.* Neues Jahrb. Geol. Paläont., Monatshefte, 1959, 72–84.

A summarizing discussion of the effects of diagenesis on the distribution of isotopes, elements, and minerals in sediments. Correlations between two or more variables are generally more useful for interpretation of diagenetic processes than absolute values alone. The $^{18}\text{O}/^{16}\text{O}$ ratio in marine carbonates and cherts appears to be an excellent indicator of geochemical alteration during diagenesis. Bibliography of 54 items. [M.A. 14–490]

A. P.

KNETSCH (GEORG) & SPRENGLER (ERWIN). *Strahlungsmessungen an sedimentären Gesteinen Unterfrankens.* Neues Jahrb. Geol. Paläont., Monatshefte, 1959, 385–397, 5 figs.

Several thousand measurements of radiation from Triassic marine sediments in lower Franconia show such constancy for certain horizons and such variation with profiles that stratigraphic application seems warranted. About 70 references nearly half are to American literature.

A. P.

JANDA (I.) & SCHROLL (E.). *Über Borgehalte in einigen ostalpinen Kohlen und anderen Biolithen.* Tscherma. Min. Petr. Mitt., 1959, ser. 3, 7, 118–129, 4 figs.

35 samples of coal and other bioliths, mostly from Austria, have been examined by emission spectroscopy

on. The maximum boron content of air-dried coal was found to be 0.06%, the maximum boron content in ash 0.3%.

A. P.

ER (P. A.). *The distribution of some minor elements between sulphide and silicate phases of sediments*. Univ. Coll. Addis Ababa, Fac. Sci., Contrib. Geophys. Obs., ser. A, 1960, no. 2, 18 pp.

The minor elements in the pyritiferous mudstone and iron-bearing manganese shales of the Lower Cambrian manganese Shale Group of the Harlech Dome, North Wales (M. 31-319; M.A. 7-437, 14-112), have distributed themselves between the sulphide and silicate phases in a manner determined by their chalcophile or lithophile tendencies. Crystallization of hydrotroilite to pyrite has not significantly affected minor element concentrations in the sulphide phase. Quantitative determinations for Co, Ni, Mn, Cr, V, Ag, and Mo and semi-quantitative values for Pb, Sr, and Ba are given for 9 pyrites: for the 3 specimens of pyrite from shale the average Co/Ni ratio is 3.45 while for pyrite from mudstone the average value is 1.00.

R. A. H.

TEDAL (IVAR). *On the distribution of strontium and barium in the eruptive rocks of the Oslo region*. Norsk Geol. Tidsskr., 1958, 38, 221-229.

Results of semi-quantitative spectrochemical analyses of Sr and Ba of the principal eruptive rocks of the Oslo region are given. The analytical method is described. The data support the geologically observed age relations within the series. Rocks of monzonitic composition are comparatively high in Sr and Ba; the younger rocks are successively poorer. Sr and Ba are moderately abundant in the series biotite-nordmarkite to biotite-granite, but tend to disappear completely in the series aegirine-nordmarkite to ekerite. The absolute concentrations of Sr and Ba in granites, as well as their coefficients of distribution between the feldspar phases of these rocks, seem to be rather insensitive to variations in the temperature of crystallization.

K. S. H.

TEDAL (IVAR). *On the development of granite pegmatite in gneiss areas*. Norsk Geol. Tidsskr., 1958, 38, 231-244.

Semi-quantitative spectrochemical analyses for Sr and Ba in feldspars from a number of pegmatites and some granites are presented. In the gneiss areas of southern Norway the granite pegmatites are typically much poorer in Sr and Ba than the large granite bodies. The origin and replacement of such pegmatites is discussed.

K. S. H.

TEDAL (IVAR). *Distribution of Ba and Sr in microcline in sections across a granite pegmatite band in gneiss*. Norsk Geol. Tidsskr., 1959, 39, 343-349, 4 figs.

Spectrochemical determinations of Ba and Sr in micro-

cline samples taken along 5 sections across a granite pegmatite band in plagioclase gneiss exhibit highly variable concentrations. Particularly low concentrations appear to occur within definite parts, which have apparently formed at later stages than the rest of the pegmatite. A contour map showing roughly the Ba distribution within the examined part of the pegmatite band has been tentatively constructed. The analytical method is described.

K. S. H.

CARSTENS (HARALD). *Note on the distribution of some minor elements in coexisting ortho- and clino-pyroxene*. Norsk Geol. Tidsskr., 1958, 38, 257-260.

Ortho- and clino-pyroxenes have been separated from two hypersthene gabbros and from a banded basic inclusion in one of them. Analyses of the two pyroxenes from a banded gabbro in Lofoten are also given though the concentrates were not of sufficient purity. Al_2O_3 , Fe_2O_3 , FeO , and MgO were determined by ordinary wet methods; Ti, Cr, V, Ni, Co, and Mn were determined spectrographically. Refractive indices are given. Al^{III} , Fe^{III} , Ti^{IV} , Cr^{III} and V^{III} are assumed to distribute themselves between tetrahedral and octahedral positions in the pyroxenes according to chemical and physical conditions prevailing at the time of the mineral formation. Mn^{II} follows Mg^{II} and Fe^{II} and the three elements are approximately twice as high in the orthopyroxenes as in the clinopyroxenes. There is some indication of an enrichment of Ni and Co in the orthopyroxenes. [M.A. 13-351]

K. S. H.

WILLIAMS (R. J. P.). *Deposition of trace elements in basic magma*. Nature, 1959, 184, 44, 2 figs.

Polarization energies of d electrons are important in the stabilization of transition metal ions in certain co-ordinations. If divalent and trivalent ions are arranged in order of decreasing polarization energies, then the orders are almost exactly as found for the selective uptake of these ions into Skaergaard intrusion silicates. [M.A. 11-495]

C. H. K.

[GONCHAROVA (T. YA.)] Гончарова (Т. Я.). О природном металлическом цинке [On native metallic zinc]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, 88, 458-459, 2 figs

Fibrous volcanic glass, 'Pele's hair', from the region of Elbrus mountain in the Caucasus, was found coated with a metallic film. Spectroscopic and X-ray analyses proved that the film was mostly of zinc with a small admixture of Pb, Sn, Ag, Fe, Cu, Cd, and Sr.

S. I. T.

SCHROLL (E.) & IBRAHIM (N. AZER). *Beitrag zur Kenntnis ostalpinen Fahlerze. Teil III. Geochemische Untersuchungen an ostalpinen Fahlerzen*. Tschermaks Min. Petr. Mitt., 1959, ser. 3, 7, 70-105.

Semiquantitative spectrographic analyses for As, Sb, Bi, Ag, Zn, Hg, Fe, Pb, Au, Cd, Ge, Sn, V, Ni, Co, and Mn are reported for about 90 samples of tetrahedrite and tennantite from the east alpine region and for a few samples from other areas in Europe, with some remarks on the distribution of Ga, In, Se, and Te in these samples. Comparisons are made with the results of spectrographic examination of sphalerite and galena from the same region. [M.A. 14-478] A. P.

LOVERING (T. S.). *Current developments in geochemical exploration*. Pakistan Journ. Sci., 1958, **10**, 26-33.

A review article on the evaluation of various methods of geochemical exploration. F. A. S.

WEBB (J. S.), TOOMS (J. S.), & GILBERT (M. A.). *Geochemical drainage reconnaissance for copper in Northern Rhodesia*. Trans. Inst. Mining Metall., London, 1959, **68**, 125-144, 7 figs.

Exploratory studies in the Northern Rhodesian copper-belt have shown that metal leached from weathering ore deposits accumulates in seasonal headwater swamps or dambos. The streams draining these swamps also carry

anomalous metal in their active sediment. Peak Cu values are of the order of 1000-4000 p.p.m. in dambo soils 500-750 p.p.m. in stream sediments, compared with corresponding mean backgrounds of 80 and 40 p.p.m. respectively. Drainage anomalies related to mineralization thus may be detected by simple rapid methods of analysis performed on small samples collected at wide intervals. Analytical techniques are described and make use of the dithizone method. R. A. I.

LANG (W. B.). *The origin of some natural carbon dioxide gases*. Journ. Geophys. Res., 1959, **64**, 127-133, 2 tables.

The geological occurrences of large quantities of carbon dioxide gas in the Imperial Valley of California, the Valley in New Mexico, Tampico, Mexico, Saratoga Springs, New York, and Soda Springs, Idaho, are reviewed. ^{13}C ratios of the gases are within the range found for carbon from limestones, but different from those for organic and other types of carbon. It is believed that the carbon dioxide originated from the breakdown of limestone in contact with igneous intrusions. F. R. I.

MINERAL DATA

BIZOUARD (H.) & ROERING (CH.). *An investigation of sphalerite*. Geol. Fören. Förh. Stockholm, 1958, **80**, 309-314, 1 fig.

A polished section of a sphalerite ore specimen from the Sturemalmen sulphide deposit, Västerbotten County, Sweden, has been analysed for iron content, as well as manganese and cadmium content by means of an electron probe micro-analyser. This instrument is capable of analysing surface areas of $1-2 \mu^2$ and gives the chemical composition of sphalerite: Zn 58.7 ± 0.4 , Fe 8.5 ± 0.2 , Mn 0.3 ± 0.1 , Cd 0% and of pyrrhotine Zn 0.3 ± 0.1 , Fe 60.7 ± 0.5 , Mn 0, Cd 0%. The results have been compared with normal chemical and spectrographic analyses from the same specimen and show good agreement. The unit cell dimension of the sphalerite is $5.418 \pm 0.001 \text{ \AA}$. The iron content and the unit cell length do not coincide with Kullerud's graph, now revised by Henriques, relating these two variables. E. W.

BUTLER (J. R.) & EMBREY (P. G.). *Delorenzite is tanteuxenite*. Min. Mag., 1959, **32**, 308-313, 1 fig.

Examination of delorenzite from the type locality, Piano del Lavonchio, Craveggia, Val Vigizzo, Piedmont, rediscovered by Gramaccioli [Natura (Milan), 1958, **49**, 110] shows it to be identical with tanteuxenite [M.M. 22-629]. Partial chemical analysis by J. R. Butler and R. Hall gave

TiO₂ 16.2, Fe₂O₃ 1.8, rare earths 24.35, U₃O₈ 7.75, Nb 4.45, Ta₂O₅ 36.4, MgO 0.19, CaO 2.17, = '92.3', Si > 1%, Al > 0.1% and Mn > 0.01%. Separate analysis of the rare earth group gave Y₂O₃ 44.5, La₂O₃ 0.83, CeO₂ 5.1, Pr₆O₁₁ 1.45, Nd₂O₃ 11.7, Sm₂O₃ 6.30, Gd₂O₃ 9.70, Tb 1.82, Dy₂O₃ 8.85, Er₂O₃ 4.68, Tm₂O₃ 0.48, Yb₂O₃ 2.1, Lu₂O₃ 0.46, = 99.47. The X-ray powder patterns of delorenzite and tanteuxenite are virtually the same. It is recommended that the name delorenzite be abandoned despite its priority, both to make clear the close relationship of the mineral to euxenite and because of its association with an incorrect chemical analysis. [M.A. 11-436]

R. A. H.

[BAZHENOV (A. I.)] Баженов (А. И.). О трансваалите месторождения юго-восточного Алтая [Transvaalite from south-east Altai]. Зап. Всесоюз. Мин. Общ. [M. All-Union Min. Soc.], 1959, **38**, 715-720, 2 figs.

Transvaalite occurs as porous nodular aggregates of calcite and is believed to represent an oxidation product of cobaltite. It is black in colour, has pitchy lustre, conchoidal fracture, H.4, sp. gr. 3.68, is easily soluble in HCl, isotropic. Chemical analysis gave SiO₂ 6.36, Al₂O₃ 0.22, Fe₂O₃ 2.38, CaO 8.51, MgO 0.61, MnO₂ 0.65, Co 49.60, NiO 0.03, As₂O₅ 10.43, H₂O+ 14.74, H₂O- 6.1, = 99.53. X-ray, thermal, and spectroscopic data are given. S. I. T.

ARK (J. R.) & CHRIST (C. L.). *Studies of borate minerals (VII): X-ray studies of ammonioborite, larderellite, and the potassium and ammonium pentaborate tetrahydrates*. Amer. Min., 1959, **44**, 1150–1158, 5 tables.

The formula $(\text{NH}_4)_2\text{O} \cdot 5\text{B}_2\text{O}_3 \cdot 5\frac{1}{2}\text{H}_2\text{O}$ has been assigned to synthetic ammonioborite from X-ray single crystal study correlating calculated (1.758 g/cm^3) with measured ($1.765 \pm 0.04 \text{ g/cm}^3$) density. Ammonioborite is monoclinic with probable space group $C2/c-C_{2h}^6$; a 25.27 ± 0.05 , b 65 ± 0.03 , c $11.56 \pm 0.03 \text{ \AA}$, and β $95^\circ 17.5' \pm 0.5'$. Crystallographic data are given for ammonium and potassium pentaborate tetrahydrate, abbreviated APT and KPT respectively. X-ray powder data are given for APT and KPT, synthetic ammonioborite and larderellite. B. H. B.

LARK (J. R.), MROSE (M. E.), PERLOFF (A.), & BURLEY (G.). *Studies of borate minerals (VI): Investigation of veatchite*. Amer. Min., 1959, **44**, 1141–1149, 2 figs., 3 tables.

Veatchite, $\text{SrO} \cdot 3\text{B}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$, has been studied correlating X-ray precession patterns with crystal habit and indices of refraction. The determinations show that veatchite is monoclinic; probable space group $A2/a-C_{2h}^6$, a 20.81 ± 0.04 , b 11.74 ± 0.03 , c $6.637 \pm 0.02 \text{ \AA}$, β $92^\circ 02' \pm 0.5'$, V 1620 \AA^3 ; the optical orientation is $\gamma=b$, $\alpha=c$, $\beta:a=-2^\circ$. The dominant forms are $\{100\}$, $\{111\}$, $\{h11\}$ with $h=2, 3, 4$. There are two perfect cleavages parallel to (100) and (011) . The calculated density with $Z=8$ is 2.86 g/cm^3 ; that measured is $2.78 \pm 0.03 \text{ g/cm}^3$. X-ray powder data are compared with previous determinations. [M.M. **30**–389, **2**–500] B. H. B.

LOBANOVA (V. V.) & KHURSHUDYAN (E. KH.) Лобанова (В. В.) и Хуршудян (Э. Х.). Исследование кристаллов сульфоборита Индерского месторождения [*Investigation of sulfoborite crystals of the Indersky deposit*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 701–705, 1 fig.

Two chemical analyses of impure sulfoborite gave MgO 0.87, 30.24, CaO 1.86, 2.46, Na 0.22, 3.08, B_2O_3 22.24, 5.39, SO_3 19.69, 22.58, Cl 0.34, 2.76, F 4.70, —, H_2O 0.1 (calc.), 21.7 (det.). Minerals present are: sulfoborite 8.1, 88.8, hydroboracite 13.7, —, sellaite 7.7, —, halite 0.6, 5.2, anhydrite —, 6.0. Sulfoborite crystals gave α 1.529, γ 1.541, γ 1.553, $2V(-)$ 87.8° – 88.3° , a 7.768, b 12.474, c 10.085, with two molecules $\text{Mg}_6\text{B}_4\text{O}_{10}(\text{SO}_4)_2 \cdot 9\text{H}_2\text{O}$ per unit cell. S. I. T.

SMITH (DEANE K.). *An X-ray crystallographic study of schroeckingerite and its dehydration product*. Amer. Min., 1959, **44**, 1020–1025.

Schröckingerite crystals from Moab, Utah, are triclinic,

pseudohexagonal. The unit cell with a 9.60, b 9.62, c 14.46 \AA , α $91^\circ 42'$, β $91^\circ 48'$, and γ $120^\circ 05'$, contains $2[\text{NaCa}_3\text{UO}_2(\text{CO}_3)_3\text{SO}_4 \cdot 10\text{H}_2\text{O}]$. On drying at 75°C six to ten molecules of water are lost. The unit cell of the dried material has $a=b$ 9.52, c 11.10 \AA , α 95° , β 93° , γ 60° . A. C. H.

HOEFER (F.). *Antigorit von Kirunavaara*. Tschermaks Min. Petr. Mitt., 1959, ser. 3, **7**, 115–117.

Antigorite crystals in plates up to $1\frac{1}{2} \times \frac{1}{2} \text{ cm}$ from Kirunavaara, Sweden, have been chemically analyzed and examined by single crystal X-ray diffraction. Chemical analysis leads to the formula $(\text{OH})_4(\text{Mg}_{2.922}\text{Fe}_{0.074})(\text{Si}_{1.991}\text{Al}_{0.009})(\text{O}_{4.983}(\text{OH})_{0.017})$. Cell dimensions [units not given], determined from three rotation patterns, are a 8×5.30 , b 9.17, c 14.63, β 90° . A. P.

WATTERS (W. A.). *A minor occurrence of sepiolite from Puyvalador, near Quérigut, France*. Min. Mag., 1960, **32**, 412–415, 2 figs.

Colourless to light yellowish and brownish sepiolite occurs as a minor constituent of dolomitic marble bordering tremolite rock from the southern contact zone of the Quérigut granite, French Pyrenees [M.M. **31**–703; M.A. **14**–150]. The colourless to light yellowish sepiolite has n 1.550–1.555, while for the brownish material n ranges 1.509–1.528; it is mostly isotropic but a patchy birefringence (0.002–0.003) is sometimes seen. A possible paragenesis, following the break-down of tremolite under the action of CO_2 is suggested. R. A. H.

[VARLAKOV (A. S.)] Варлаков (А. С.). Монтителлитовая порода из ахматовской копи [*Monticellite rock from the Akhmatov mine*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 594–597, 2 figs.

Monticellite-andradite skarn rock from Akhmatov mine, S. Urals, is described. The amount of monticellite varies from 70 to 80%. Monticellite occurs as irregular grains, with α 1.638, γ 1.651, $2V(-)$ 88° . On analysis it gave SiO_2 37.72, FeO 0.50, MnO 0.15, MgO 25.34, CaO 34.94, ign. loss 1.24, = 99.88. Forsterite, vesuvianite, leuchtenbergite, brucite, magnetite, calcite, and perovskite are also present in small quantities. S. I. T.

[DUDKIN (O. B.)] Дудкин (О. Б.). О бариевом лампрофиллите [*On barium lamprophyllite*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 713–715, 1 fig.

A barium lamprophyllite is described from lujavrite pegmatite at Yukspor, Khibina tundra, Kola peninsula. It is of a lighter colour than the usual type, α 1.747, β 1.750, γ 1.773, $c:\gamma$ $5^\circ 30'$, $2V$, $39^\circ 40'$, absorption $\gamma > \beta > \alpha$. Chemical analysis gave SiO_2 29.75, TiO_2 29.07, Al_2O_3 0.42,

Fe_2O_3 1.82, FeO 3.00, MnO 1.51, MgO 0.92, CaO 1.44, SrO 7.22, BaO 9.23, Na_2O 9.94, K_2O 2.26, F 1.80, Cl 0.59, $\text{H}_2\text{O}+$ 1.19, $\text{H}_2\text{O}-$ 0.54, $-\text{O}$ for F and Cl 0.88 = 99.82; sp. gr. 3.545. [M.A. 3-236, 9-173] S. I. T.

[МАКАРОШКИН (B. A.), ГОНИБЕСОВА (K. A.), & МАКАРОШКИНА (M. S.)] Макарович (B. A.), Гонибесова (K. A.) и Макарошкина (M. C.). Чевкинит из Ильменских гор [Chevkinite from the Ilmen Mountains]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union. Min. Soc.], 1959, **88**, 547-553, 2 figs.

Chevkinite [M.A. 3-405, 406] occurs in quartz-feldspar veins found in the contact zone between granite-gneiss and syenite in Ilmen and Vishnevye Mountains, Urals. Goniometric measurements agree with those of A. K. Boldyrev and additional faces are recorded (401), ($\bar{4}0\bar{1}$), ($\bar{1}02$), and ($10\bar{2}$). Three morphological types are distinguished. Chevkinite is isotropic, $n=1.93$ (Semenov), $n=1.940-1.944$ (Ananchenko & Shmushkovich). Heating and dehydration curves are given; and 5 new chemical analyses by K. A. Gonibesova recorded, as follows:

	SiO_2	ThO_2	TiO_2 (Nb,Ta) O_3	Al_2O_3	Fe_2O_3	Cr_2O_3	CeO_2	Ce_2O_3	$(\text{Yb,Er})_2\text{O}_3$	$(\text{La,Pr})_2\text{O}_3$	
1.	18.95	1.80	19.31	—	—	2.56	—	21.98	—	0.25	22.25
2.	18.50	3.46	19.21	—	—	3.20	—	22.15	—	0.42	19.75
3.	17.26	3.22	15.94	7.40	—	1.80	—	19.61	—	0.68	18.04
4.	18.51	3.46	14.65	2.47	—	2.14	—	21.76	—	0.28	21.16
5.	18.88	1.24	16.97	2.75	—	2.21	—	21.99	—	0.19	21.84

	FeO	MnO	MgO	CaO	PbO	Na_2O	K_2O	$\text{H}_2\text{O}+$	$\text{H}_2\text{O}-$	Total	Sp. gr.
1.	9.43	0.79	0.24	2.55	—	—	tr.	—	0.32	100.43	4.361
2.	10.10	0.71	0.19	2.98	—	—	—	—	—	100.67	4.361
3.	9.70	0.91	0.20	3.79	1.03	0.27	0.14	—	0.16	100.15	—
4.	10.57	0.56	0.46	3.38	0.28	0.34	0.27	—	—	100.28	—
5.	9.98	0.65	0.11	3.22	abs.	—	—	—	—	100.03	—

Chemical analyses suggest the formula $A_3B_2\text{Si}_2\text{O}_{12}$ in which $A=\text{Fe}^{\text{II}}$, Ce , La , Ca , Na , Th , Mn , Mg , and $B=\text{Ti}$, Nb , Fe^{III} , Al . The differences between chevkinite, orthite, aeschynite, and samarskite are noted. Perrierite [M.A. 11-310] is considered an analogue of chevkinite. S. I. T.

HONEA (RUSSELL M.). *New data on gastunite, an alkali uranyl silicate*. Amer. Min., 1959, **44**, 1047-1056, 1 fig.

Gastunite $(\text{K,Na})_2(\text{UO}_2)_3(\text{Si}_2\text{O}_5)_4 \cdot 8\text{H}_2\text{O}$ occurs as a secondary mineral in Yuma County, Arizona, Presidio County, Texas, and the Easton area, Pennsylvania. Chem. anal. gave: SiO_2 31.2, UO_3 53.8, K_2O 4.6, Na_2O 0.9, H_2O 9.5, = 100.0%. X-ray studies show the mineral to be orthorhombic, a 14.24, b 35.84, c 14.20; sp. gr. is 3.96. Habit is radiating acicular to fibrous aggregates, with H.2 and perfect (010) cleavage. It is optically biaxial positive, α 1.604, β 1.610, γ 1.621; 2V moderate. A. C. H.

MÉLON (J.) & DEJACE (J.). *La cuprosklodovskite*. Bull. Acad. roy. Belgique, Cl. Sci., sér. 5, 1959, **45**, 507-515, 3 figs.

Cuprosklodovskite is triclinic with parameters a 7.04,

b 9.18, c 6.66Å, α 109°14', β 90°00', γ 108°22'. The acicular crystals, elongated along [100] have the faces (001), (010), ($\bar{1}11$), (110), ($\bar{1}20$), ($2\bar{1}0$); twins are common with twin axis [100] and composition plane (010), or with twinning plane (210). The optical orientation is specified and the refr. ind., optic axial angle, and powder data are given. R. V. T.

[BONDAREVA (A. M.), ROGACHEV (D. L.), & SAKHAROV (A. S.)] Бондарева (A. M.), Рогачев (Д. Л.) и Сахаров (A. C.). Литийсодержащий щелочной амфибол контактной зоны Ловозерского массива [Lithium-containing alkali amphibole from the contact zone of the Lovozero massif]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 710-712.

An amphibole is described from an albite-rich pegmatite at the northern contact of the Lovozero massif in the Kola peninsula. It is of a dark bluish-green colour, α 1.661, β 1.661, γ 1.674, $c:\alpha$ 13°, 2V(+) 86° (central part), 86° (outer part), pleochroism α dark azure, β greyish-azure, γ light greenish-yellow; sp. gr. 3.196. Chemical analysis gave SiO_2 53.70, TiO_2 0.29, ZrO_2 0.05, Al_2O_3 1.85, Fe_2O_3 15.27, FeO 3.56, MnO 1.05, CaO 0.21, SrO tr., MgO 9.4, Na_2O 10.40, K_2O 1.34, Li_2O 0.24, $\text{H}_2\text{O}+$ 1.02, $\text{H}_2\text{O}-$ 0.4, F 2.11, Cl abs., = 100.95, $-\text{O}$ for F 0.88, = 100.07. X-ray data are given. S. I. T.

DUFFIN (W. J.) & GOODYEAR (J.). *A thermal and X-ray investigation of scarbroite*. Min. Mag., 1960, **32**, 333-362, 3 figs.

BRINDLEY (G. W.) & COMER (J. J.). *Electron-optical study for crystals of scarbroite*. Ibid., 363-365, 2 figs.

Scarbroite occurs as a fine-grained compact deposit in fissures in sandstone in South Bay, Scarborough, Yorkshire [M.A. 4-479]. Chemical analysis by R. A. Chalmers gave SiO_2 3.2, Al_2O_3 45.7, MgO 0.1, Na_2O 1.7, K_2O 0.2, H_2O 3.1, SO_3 1.8, CO_2 7.9, = 98.5, leading to an idealized formula $\text{Al}_2(\text{CO}_3)_3 \cdot 12\text{Al}(\text{OH})_3$. X-ray and electron diffraction data indicate a possible triclinic cell with a 9.94, b 14.88, c 26.47Å, α 98.7°, β 96.5°, γ 89.0°. A layer structure of gibbsite-type sheets of $\text{Al}(\text{OH})_3$ and sheets of $\text{Al}_2(\text{CO}_3)_3$ is proposed. Electron micrographs show thin platy crystals of about 1 μ size with rhombic outlines, and the X-ray reflections show pseudohexagonal symmetry. Heat experiments demonstrate the existence of two phases of the phase designated hydroskarbroite spontaneously dehydrating to scarbroite when left in a normal humid atmosphere. At 130°C the X-ray pattern of scarbroite is replaced by one corresponding to a further modification, metaskarbroite. X-ray powder data for all three modifications are tabulated together with infrared absorption curves showing that dehydration begins at 250°C and is completed at 500°C. R. A. F.

DO (TOSHIO). *Iron-rich saponite found from Tertiary iron sand beds of Japan (re-examination on 'Lembergite')*. Journ. Geol. Soc. Japan, 1954, **60**, 18-27, 2 figs.

New data are reported on the mineral named lebergite the author [M.A. 10-147]: refr. ind. 1.56-1.58; pleochroism, α green to greenish brown, γ greenish brown to dark brown. Chemical analysis of pure material separated from faceous sandstone at Moniwa, Miyagi Prefecture, gave: Fe_2O_3 39.68, Al_2O_3 3.93, Fe_2O_3 19.82, FeO 1.12, MgO 11.21, TiO_2 0.37, MnO 0.19, $\text{H}_2\text{O} +$ 6.16, $\text{H}_2\text{O} -$ 15.11, 99.96. A d.t.a. curve is pictured and X-ray diffraction patterns are tabulated. The basal reflection shifts from 7 to 16.9 kX by treatment with ethylene glycol. Lembergite is an iron-rich saponite. A. P.

ALENOV (A. D.) [Каленов (А. Д.). О грейзеновом типе гелвиновой минерализации [On the greisen type of the helvine mineralization]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 481-485, 2 figs.

Helvine is found in a quartz muscovite greisen in one of the ore-deposits in Central Asia. Helvine is associated with beryl, bismuthinite, bromellite, and scheelite. Helvine occurs as crystals and aggregates of brownish or more rarely greenish colour, n 1.738, cubic, a 8.27 Å. Chemical analysis gave BeO 14.20, SiO_2 31.74, Al_2O_3 2.40, FeO 10.12, MnO 0.90, ZnO 5.20, CaO 2.14, MgO tr., S 6.30, =102.00.

S. I. T.

YOSHINAGA (M.). *Helvite from Yagisawa mine, Nagano Prefecture, Japan*. Mem. Fac. Sci. Kyushu Univ., ser. D, 1959, **9**, 47-53, 1 fig.

Amber to green helvine occurs associated with danmorite, spessartine, fluorite, and quartz in the rhodonite pyroxmangite ore of the Yagisawa mine, Nagawa-mura, Ishichikuma-gun, 30 km S.W. of Matsumoto city. It has D_{25}^{25} 3.21, H 6, a 8.272 Å: indexed X-ray powder data are tabulated together with that for helvine (a 8.238 Å) from Iron Mountain, New Mexico [M.A. 9-61]. Chemical analysis by M. Yoshinaga gave SiO_2 31.29, TiO_2 nil, Al_2O_3 5.52, FeO 4.19, MnO 47.36, BeO 13.88, ZnO nil, MgO tr., H_2O 0.17, S 5.93, H_2O 0.01, less $0 \equiv \text{S}$ 2.96, =100.39. X-ray powder data are also recorded for the associated pale brown annemomite and reddish black hübnerite. [M.M. 32-87]

R. A. H.

NILL (DIANE C.). *Thaumasite from Co. Down, Northern Ireland*. Min. Mag., 1960, **32**, 416-418.

The relatively rare zeolite thaumasite occurs in a tertiary dolerite sill, encountered in a borehole near Flushall, Ballyalton, Newtownards, Co. Down. It forms tabular colourless crystals with ε 1.470, ω 1.504. Indexed

X-ray powder data (by B. R. Young) are tabulated and indicate a hexagonal cell with a 11.03, c 10.40 Å. [M.A. 1-33, 112, 2-189, 5-325, 7-356] R. A. H.

BRIÈRE (Y.), GASPERIN (M.), & KURYLENKO (C.). *Cristaux d'ilmenorutile de Madagascar*. Bull. Soc. franç. Min. Crist., 1959, **82**, 401.

Crystals of ilmenorutile from near Ambodibonara, S.W. of Vatomandry, on the E. coast of Madagascar, have D 4.37 g/cm³; a 4.62, c 2.96 Å: the crystals are twinned on {101}. The presence of Fe, Nb, and Ta were confirmed spectrographically. Indexed X-ray powder data are tabulated.

R. A. H.

[КОМКОВ (А. И.)] Комков (А. И.). О рентгеновской диагностике минералов группы фергусонита [On the X-ray diagnosis of minerals of the fergusonite group]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 655-660, 3 figs.

X-ray studies of synthetic members of the series YNbO_4 - YTbO_4 and YNbO_4 -(Y,TR) NbO_4 provided data for the construction of composition/properties diagrams. Unit cell parameters a , b , c , and β are given, along with specific gravities determined by the method of Vasilevsky and Rudenko [M.A. 13-321] and calculated from the X-ray data. The effects of preliminary thermal treatment are discussed. [M.M. 32-392] S. I. T.

[СОКОЛОВА (Е. П.)] Соколова (Е. П.). Некоторые новые данные по исследованию эвксенита [Some new data on euxenite investigation]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 408-418, 5 figs.

Euxenite from an albitized and tourmalinized pegmatite vein from an unnamed locality is described. Goniometric data are given for (010), (100), (110), (111), (201), (160), (140), (201), and (251) faces. Two analyses gave: (1) TiO_2 17.03, Nb_2O_5 + Ta_2O_5 35.85, Y_2O_3 + Er_2O_3 + Ce_2O_3 + La_2O_3 + Dy_2O_3 28.85, UO_2 7.22, UO_3 tr., ThO_2 3.30, Fe_2O_3 2.62, SiO_2 1.62, Al_2O_3 tr., CaO 1.26, MnO 0.14, SnO_2 0.20, ign. loss 1.55 (0.70 + insol. res.), =100.53, sp. gr. 5.32; (2) TiO_2 17.85, Nb_2O_5 29.69, Ta_2O_5 6.56, Y_2O_3 + Er_2O_3 27.31, Ce_2O_3 0.22, UO_2 7.75, UO_3 tr., ThO_2 4.75, Fe_2O_3 2.62, SiO_2 0.50, Al_2O_3 tr., CaO 1.22, MnO 0.23, SnO_2 0.29, ign. loss 1.37, =100.46, sp. gr. 5.46. Thermal study showed that the endothermal effect at 20°-350°C is due to the loss of water, and that the sharp exothermal effect at 720°-785°C is due to the transformation of the metamict mineral into a crystalline state. After heating at 900-1100°C the mineral changes to a yellow-brown colour, sp. gr. 5.94, α 2.25-2.28, γ 2.30-2.35, biaxial, medium angle of optic axes, straight extinction. X-ray analysis gave a 5.57, b 14.65, c 5.18 Å. S. I. T.

VAN TASSEL (R.). *Bolivarite restudied*. Min. Mag., 1960, **32**, 419–420.

A re-examination of the type material from Pontevedra, Spain [M.A. 1–378], showed bolivarite to be very weakly birefringent, n 1.506, sp. gr. 2.04; it is amorphous to X-rays. Chemical analysis gave Al_2O_3 36.2, P_2O_5 24.9, H_2O 39.5, =100.6 (H_2O at 110°C after 88 hours=25.5%); the $\text{Al}_2\text{O}_3 : \text{P}_2\text{O}_5$ ratio of 2 : 1 is confirmed. R. A. H.

BOSTRÖM (K.). *The chemical composition and symmetry of caryinite*. Arkiv Min. Geol. Stockholm, 1957, **2**, 333–336.

By means of rotation and Weissenberg equi-inclination photographs caryinite is shown to be monoclinic and belong to space group $P2_1/c$ with a 11.48, b 13.17, c 6.87Å, and β 99.0° (powder data). A partial analysis has been carried out and by combination with earlier data the following composition is obtained: As_2O_5 49.57, P_2O_5 0.19, SiO_2 0.21, MgO 3.09, FeO 0.54, MnO 18.66, Na_2O 5.16, K_2O 0.37, CaO 12.12, BaO 1.03, PbO 9.21, H_2O 0.53, =100.68. The formula is $(\text{Pb,Ca,Na,Mn})_3(\text{Mg,Mn})_2(\text{AsO}_4)_{3-y}(\text{OH})_x$ and the unit cell contains 4 molecules. K. F.

MROSE (M. E.) & KNORRING (O. VON). *The mineralogy of väyrynenite, $(\text{Mn,Fe})\text{Be}(\text{PO}_4)\text{OH}$* . Zeits. Krist., 1959, **112**, 275–288, 3 figs.

Re-examination of väyrynenite from the type locality at Viitaniemi, Eräjärvi, central Finland [M.A. 12–354, 568], shows it to be monoclinic, space group $P2_1/a-C_{2h}^5$; a 5.41, b 14.49, c 4.73Å, β 102°45'; $Z=2$. Indexed X-ray powder data are given. Chemical analysis by O. von Knorring gave MnO 34.01, FeO 5.92, CaO 0.53, BeO 13.85, Na_2O 0.20, K_2O 0.04, Al_2O_3 0.40, P_2O_5 39.98, $\text{H}_2\text{O}+$ 4.93, $\text{H}_2\text{O}-$ 0.19, insol. 0.06, =100.11. It has sp. gr. 3.22; α 1.638, β 1.658, γ 1.664; $\alpha : c = -31^\circ$, $\beta = b$; dispersion $r > v$, moderate; $2V_\alpha$ 54°08'; pink or grey, almost colourless in transmitted light. The close structural relationship between väyrynenite and euclase is discussed, new X-ray data being given for euclase. R. A. H.

[MALTSEV (I. E.)] Мальцев (И. Е.). Триплит из пегматита Ильменских гор [*Triplite from pegmatite in the Ilmen Mountains*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 150–153, 1 fig.

Triplite is found in a quartz-amazonite pegmatite vein. Analysis gave: MnO_2 2.35, MnO 51.77, FeO 8.49, CaO 2.21, MgO 1.05, F 6.94, P_2O_5 30.27, SiO_2 , TiO_2 , Al_2O_3 , Fe_2O_3 abs., =103.08, —O for F 2.90, =100.18. Approximate formula $(\text{Mn,Fe,Ca,Mg})_{17}\text{F}_7(\text{PO}_4)_8$. Colour dark brown, H. 4.5; α 1.661, β 1.671, γ 1.689, $2V(+)$ 86–88°. S. I. T.

[LUKANINA (M. I.)] Луканина (М. И.). Сванбергит в бокситах Каменского района на среднем Урале [*Svanbergite in the bauxites of the Kamensky region in the Ural*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 586–591, 6 figs.

Svanbergite occurs as crystals and incrustations in veins and cavities of bauxites at Kolchedan station, 120 km E. of Sverdlovsk in the Urals. It is colourless, sp. gr. (crystalline) 2.9–3.2, (crystalline) 2.97–3.1; uniaxial, positive H. 2–4; α 1.636, γ 1.646, a 6.94, c 16.7Å. Chemical analysis gave SiO_2 1.03, Fe_2O_3 0.28, Al_2O_3 39.84, CaO 4.01, SO_3 14.16, P_2O_5 19.82, SO_3 5.27, $\text{H}_2\text{O}+$ 14.22, $\text{H}_2\text{O}-$ 1.26, =100.26. Thermal and dehydration curves are given. S. I. T.

[EPSTEIN (G. YU)] Епштейн (Г. Ю.). О молибдатах уранинита и иригинита [*On molybdates of uraninite and iriginite*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 564–570, 3 figs.

A new chemical analysis of moluranite [M.A. 14–13]. M. M. Stukalova gave MoO_3 38.50, UO_2 10.30, UO_3 32.4, SiO_2 4.56, ign. loss 14.03, =99.74, corresponding $\text{UO}_2 \cdot 3\text{UO}_3 \cdot 7\text{MoO}_3 \cdot 20\text{H}_2\text{O}$. It is stated that moluranite is quite different in composition from umohoite [M.A. 12–2] which may represent the product of its oxidation. Additional X-ray data and d.t.a. curves are given for moluranite and iriginite [M.A. 14–14]. Two new minerals probably belonging to this group were noted to occur in albitites. Small quantities of these did not allow chemical analyses and only a general description of them is given. S. I. T.

KAMHI (SAMUEL R.). *An X-ray study of umohoite*. Am. Min., 1959, **44**, 920–925, 3 figs.

Umohoite, a hydrous uranyl molybdate is orthorhombic with unit cell dimensions a 6.32, b 7.48, c 12.4Å (single crystal) and 14.5–17.0Å (powder). The c dimension varies with atmospheric humidity and inversely with increasing temperature; ordinarily c may be 14.5–17.0Å. [M.A. 12–2] A. C. H.

KNORRING (O. VON) & DEARNLEY (R.). *The Lewisian pegmatites of South Harris, Outer Hebrides*. Min. Mag., 1960, **32**, 366–378, 4 figs.

Minerals recorded in the Lewisian acid pegmatites of South Harris [M.A. 7–166, 13–503] include quartz, albite, microcline, biotite, muscovite, magnetite, beryl, spessartine, gahnite, columbite, monazite, zircon, pyrite, epidote, tourmaline, apatite, thorite, thorogummite, uranophane, kasolite, and allanite. Analyses by O. von Knorring reported for biotite (A) from the Sletteval pegmatite, $\gamma \approx \alpha$ 1.635, sp. gr. 3.03, and for spessartine (B), n 1.81, a 11.60Å, sp. gr. 4.19, gahnite (C), n 1.795, a 8.10Å, sp.

55, and columbite with $\text{SiO}_2 + \text{Al}_2\text{O}_3$ 1.25, ZrO_2 0.10, FeO 12.41, MnO 6.69, Nb_2O_5 65.20, Ta_2O_5 12.56, TiO_2 1.84, 100.05, a 5.11, b 14.21, c 5.75 Å, sp. gr. 5.61, all from the Chiapaval pegmatite. Other data include for the Loch Sgurr pegmatite a partial analysis of magnetite, brownish and monazite with γ 1.842, uranophane with γ 1.699; for the Sletteval pegmatite, thorogummite with n 1.610, yellow thorite with n 1.685, sp. gr. 4.30; for the Chiapaval pegmatite uraninite with a 5.45 Å, sp. gr. 10.28.

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	K_2O	Total
35.75	2.94	17.10	3.59	18.84	0.67	8.14	0.04	9.17	100.23
36.10	—	20.87	4.10	16.20	21.47	0.57	0.51	—	99.82
0.12	0.00	55.91	—	7.90	0.42	0.12	tr.	—	100.32

Included in the totals are: (A) Li_2O 0.05, Na_2O 0.08, $\text{H}_2\text{O} +$ 3.72, $\text{H}_2\text{O} -$ 0.04, P_2O_5 nil, Cl nil, $\text{O} \equiv \text{F}$ 0.08; (C) ZnO 35.85.

R. A. H.

ELIN (E.). *Notes on the mineralogy of Sweden.* 1-2. Arkiv Min. Geol. Stockholm, 1958, **2**, 373-379.

In Part 1, andersonite, liebigite, and schrockingerite from the Stripa iron mine in central Sweden are described. Powder data as well as specific gravities and indices of refraction are given. An analysis of water from the mine is given and the formation of the three uranyl carbonates is discussed with regard to their solubility, the pH of the solutions, etc.

In Part 2, ferrocolumbite from Sörhällan, Råneå, in northern Sweden is described with powder data and the following chemical analysis: H_2O 1.6, Na_2O 0.3, MgO 0.8, CaO 0.6, MnO 2.9, FeO 14.6, Ce_2O_3 (&c) 0.5, U_3O_8 0.2, H_2O_2 0.1, TiO_2 1.1, Nb_2O_5 68.7, Ta_2O_5 7.7, = 99.1%. The formula is $(\text{Fe}_{0.72}\text{Mn}_{0.15}\text{X}_{0.23})(\text{Nb}_{0.89}\text{Ta}_{0.06}\text{Ti}_{0.05})_2\text{O}_6$, where X = small quantities of Mg, Ca, Na, Ce, U, and Th. K. F.

EHJÄRVI (MAUNO). *The alkaline district of Iivaara, Kuusamo, Finland.* Bull. Comm. géol. Finlande, 1960, **185**, 1-62, 23 figs., 24 tables, 1 pl.

The rocks of the alkaline district of Iivaara are petrographically described and six silicate analyses of rocks are presented. Several minerals of the rocks concerned are fully described.

Nepheline: SiO_2 41.36, Al_2O_3 33.93, Fe_2O_3 1.08, FeO 0.18, MgO tr., CaO 0.15, Na_2O 16.33, K_2O 5.97, H_2O (\pm) 0.78, 99.78; sp. gr. 2.638; ω 1.545, ϵ 1.541, α 10.001, c 8.379 Å, 725.8 Å³.

Cancrinite: SiO_2 35.40, TiO_2 none, Al_2O_3 29.78, Fe_2O_3 0.05, FeO 0.42, MnO none, MgO 0.13, CaO 1.12, Na_2O 17.77, K_2O 0.96, Cl 0.35, SO_3 4.70, CO_2 2.16, $\text{H}_2\text{O} +$ 4.17, $\text{H}_2\text{O} -$ none, = 100.01; sp. gr. 2.402; ω 1.499, ϵ 1.493, 12.74, c 5.22 Å, V 733.2 Å³.

Pectolite: SiO_2 51.84, R_2O_3 1.92, MgO 0.10, CaO 38.74, Na_2O 4.83, K_2O 0.23, $\text{H}_2\text{O} +$ 2.06, $\text{H}_2\text{O} -$ none, = 99.72; sp. gr. 2.886; α 1.602, β 1.609, γ 1.637.

Pyroxene from melteigite: SiO_2 52.66, TiO_2 0.57, Al_2O_3 1.00, Fe_2O_3 9.06, FeO 5.60, MnO 0.28, MgO 9.90, CaO 16.83, Na_2O 4.15, K_2O 0.06, $\text{H}_2\text{O} +$ 0.06, $\text{H}_2\text{O} -$ 0.02, = 100.19; sp. gr. 3.416; α 1.708, β 1.720, γ 1.741, $2V$ 88°, $\alpha : c$ 18°; a 9.71, b 8.96, c 5.24 Å, β 105.3°, V 439.7 Å³.

Biotite: SiO_2 37.48, TiO_2 2.27, Al_2O_3 15.29, Fe_2O_3 none, FeO 14.70, MnO 0.21, MgO 16.52, CaO 0.1, Na_2O 0.97, K_2O 8.96, CO_2 none, $\text{H}_2\text{O} +$ 3.53, $\text{H}_2\text{O} -$ 0.06, F 0.01, = 100.10; sp. gr. 3.014; α 1.580, β 1.626, γ 1.626, $2V\alpha$ 14°.

Iivaarite: SiO_2 27.67, TiO_2 14.20, Al_2O_3 3.05, Fe_2O_3 19.28, FeO 3.62, MnO 0.22, MgO tr., CaO 31.08, Na_2O 0.62, K_2O 0.20, H_2O none, ign. loss 0.11, = 100.05; sp. gr. 3.732; n 1.97, a 12.138 \pm 0.006 Å, V 1788.3 Å³.

Sphene: SiO_2 29.95, TiO_2 38.93, Al_2O_3 0.37, Fe_2O_3 0.77, FeO 0.14, MnO 0.04, MgO 0.14, CaO 28.44, Na_2O 0.31, K_2O none, P_2O_5 0.02, $\text{H}_2\text{O} +$ 0.32, $\text{H}_2\text{O} -$ none, $V_2\text{O}_5$ 0.12, F 0.10, = 99.65, $-\text{O} \equiv \text{F}_2$ 0.04, = 99.61; sp. gr. 3.515; α 1.91, $2V\gamma$ 26°.

Apatite: SiO_2 0.12, TiO_2 none, Al_2O_3 0.28, Fe_2O_3 0.16, FeO none, MnO 0.02, MgO 0.05, CaO 55.78, Na_2O 0.15, K_2O none, P_2O_5 41.48, CO_2 0.98, $\text{H}_2\text{O} +$ 0.22, $\text{H}_2\text{O} -$ none, $V_2\text{O}_5$ 0.05, F 1.30, Cl none, = 100.59, $-\text{O} \equiv \text{F}_2$ 0.55, = 100.04; sp. gr. 3.161; ω 1.6453 \pm 0.006 [70.0006], ϵ 1.6404 \pm 0.002.

V. M.

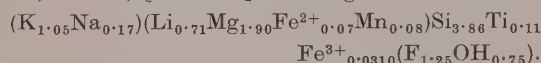
[SEME NOV (E. I.)] Семенов (Е. И.). Литиевые и другие слюды и гидрослюды в щелочных пегматитах Кольского Полуострова [*Lithium-bearing and other micas and hydromicas in the alkali pegmatite of Kola Peninsula*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 107-137, 12 figs., 12 tables.

Polyolithionite, tainiolite, spodiophyllite, celadonite, etc., as well as their hydrated varieties, found in nepheline syenites of Kola Peninsula, are described and the following data given:

Polyolithionite surrounds crystals of microcline or occurs as small scales in natrolite. It is commonly white with occasional brown pink, greenish or bluish coloration, H . 3, sp. gr. 2.817, Optically negative with a small $2V$ angle, $\gamma = \beta$ 1.56, α 1.53, melts in blow-pipe flame at about 1000°. New analysis of material from Mt. Nepkha given as SiO_2 59.46, TiO_2 0.20, Al_2O_3 12.25, Fe_2O_3 0.95, MnO 0.20, MgO 2.94, CaO 0.60, Li_2O 3.66, Na_2O 2.60, K_2O 12.00, $\text{H}_2\text{O} +$ 1.50, $\text{H}_2\text{O} -$ 0.40, F 5.60, [= 102.36]. Formula: $(\text{K}_{1.01}\text{Na}_{0.33}\text{Ca}_{0.06})(\text{Li}_{0.98}\text{Mg}_{0.29}\text{Fe}_{0.05}\text{Mn}_{0.01}\text{Al}_{0.94})\text{Si}_{3.97}\text{Ti}_{0.01}\text{Al}_{0.02}\text{O}_{10}(\text{F}_{1.18}\text{OH}_{0.82})$. X-ray and d.t.a. data also given. In nature polyolithionite is commonly hydrated and a new name of *hydropolyolithionite* is suggested for this variety, which occurs as a brownish white mass with $\gamma \approx 1.515$, $\alpha \approx 1.510$ and sp. gr. 2.50. Its composition is SiO_2 57.44, Al_2O_3 15.50,

Fe_2O_3 15.50, MgO 1.70, CaO 0.64, Li_2O 5.16, Na_2O 0.64, K_2O 8.79, H_2O — 3.68, F 1.04, rest 0.43, [=110.52].

Tainiolite is found near Mt. Nepkha in association with schizolite and apatite, forming commonly zoned crystals in which the brown colour is of variable intensity from one zone to another. Its sp. gr. is 2.821, H. 3; melts in the flame of a blow pipe at 1185° ; optically negative, $2V$ about 5° , under the microscope pleochroic from colourless along α to yellow along γ . $\gamma \approx \beta \approx 1.570$, $\alpha 1.540$, O.A.P. || (010), unit cell monoclinic with a 5.27Å, b 9.13Å, c 10.12Å, β $100^\circ \pm 15'$. Chemical analysis by V. A. Moleva shows SiO_2 52.88, TiO_2 2.00, Al_2O_3 tr., FeO 1.89, MnO 1.38, MgO 17.42, Li_2O 2.44, Na_2O 1.22, K_2O 11.38, $\text{H}_2\text{O} +$ 4.24, H_2O — 2.00, F 5.36, [=102.21] resulting in the formula:



Tainiclite is commonly replaced by polyolithionite.

Spodiophyllite occurs in hexagonal grey almost uniaxial crystals, with H. 3 and sp. gr. 2.633 and $\gamma \approx \beta 1.580$, $\alpha \approx 1.550$, and has been found to be nearly identical with though less iron rich than the type specimens from Greenland. Chemical analysis gives: SiO_2 49.20, TiO_2 1.14, Al_2O_3 4.84, Fe_2O_3 2.35, FeO 3.51, MnO 0.60, MgO 19.04, CaO 0.32, Li_2O 0.47, Na_2O 3.11, K_2O 9.70, $\text{H}_2\text{O} +$ 0.60, F 4.20, [=99.08]. The mineral is found in association with aegirine, natrolite, and apatite. It is unstable under hypergene conditions.

Astrophyllite described from Khibina forms aggregates in microcline and natrolite in strands of pale-yellow or greenish colour. Its sp. gr. is 3.06, optically biaxial, positive, $2V(+)$ 65° , $\gamma \approx 1.72$, $\beta \approx 1.67$, the pleochroism, is

yellow to colourless, $c : \gamma$ 2° . The studied mineral has high MgO and TiO_2 and a very low MnO . The full chemical analysis by C. H. Fedorchuk shows: SiO_2 39.00, TiO_2 9.73, Nb_2O_5 0.71, Al_2O_3 3.26, Fe_2O_3 4.39, FeO 21.91, MnO 4.96, MgO 2.83, CaO 2.33, Na_2O 4.10, K_2O 6.35, [=99.5]. Other specimens are also described for purposes of comparison. X-ray data given, suggesting structural similarity with micas of biotite-lepidolite type.

Celadonite is found in the zones of intense hydrothermal alteration of ijolite, urtite, and foyaite in Kola Peninsula. Celadonite here is secondary after aegirine. It has a green-bluish colour, sp. gr. 2.767, optically biaxial, negative, small $2V$, γ 1.640, α 1.626, intensely pleochroic from bluish-green (along γ) to very pale yellow (along α). The colour is attributed to oxidized iron. Chemical analysis by E. I. Koulchitzkaya shows SiO_2 43.92, TiO_2 4.4, Fe_2O_3 13.55, Al_2O_3 5.24, FeO 2.94, MgO 3.37, CaO 9.4, MnO 0.10, Na_2O 0.07, K_2O 8.23, P_2O_5 0.20, ign. loss 8.3, H_2O — 0.24, [=99.77].

For all these minerals certain X-ray and d.t.a. data and the results of qualitative spectroscopic analyses are given. In addition, details of normal micas such as biotite, lepidomelane, and muscovite are presented and their chemical analyses given. These data are used to verify the extent of isomorphism in micas, indicating the existence of a polymorphous series phlogopite-spodiophyllite-tainiolite-tainiolite-polyolithionite. This allows the construction of a four component diagram for micas. It is claimed that corresponding to the normal micas there are also hydrous micas. N. F.

NEW MINERALS

RAMDOHR (P.) & SCHMITT (MARGRET). *Oregonit, ein neues Nickel-Eisenarsenid mit metallartigen Eigenschaften*. Neues Jahrb. Min., Monatshefte, 1959, 239–247, 7 figs.

A new nickel-iron arsenide from Josephine Creek, Josephine County, Oregon, is named *oregonite*. X-ray fluorescence analysis indicated a composition Ni_2FeAs_2 . It is hexagonal, with a 6.083Å, c 7.130, sp. gr. (calc.) 6.92; $Z=3$; strongest X-ray reflections occur at 2.314, 2.119, 1.991 and 1.739Å. Its appearance in reflected light is described in detail.

R. A. H.

[KOSTOV (IVAN)] Костов (Иван). Висмутовый джемсонит или сахароваит — новый минеральный вид [*Bismuth jamesonite or sakharovaite—a new mineral species*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, 10, 148–149.

A mineral, originally described by M. S. Sakharova [M.A. 13–164] as bismuth jamesonite is now named *sakharovaite*. [A.M. 41–814; M.M. 31–954] S. I. T.

STRUNZ (H.). *Chudobaite, ein neues Mineral von Tsumeb*. Neues Jahrb. Min., Monatshefte, 1960, 1–7, 4 figs.

A new mineral from the second oxidation zone of the Tsumeb mine, South West Africa, gave the following analysis, by Fresenius and Schneider, MnO 2.0, MgO 12.0, CaO 1.0, Na_2O 5.0, K_2O 2.0, ZnO 11.5, CuO 1.0, As_2O_5 49.7, $\text{H}_2\text{O} +$ 17.0, =100.4, leading to the formula $(\text{Na},\text{K})(\text{Mg},\text{Zn})_2\text{H}[\text{AsO}_4]_2 \cdot 4\text{H}_2\text{O}$. It is named *chudobaite* in honour of Prof. K. F. Chudoba of the University of Bonn. The mineral has distinct (010) and less distinct (100) cleavages; H. $2\frac{1}{2}$ –3; sp. gr. 2.94. The symmetry is triclinic with forms (100), (010), (001), (110), ($\bar{1}20$), ($\bar{1}80$), (110), ($\bar{1}84$), and perhaps (186); a 7.69, b 11.37, c 6.59Å, α $115^\circ 54'$, β $95^\circ 54'$, γ $94^\circ 06'$; $Z=2$, space group $C1$; strongest X-ray powder reflections 10.163, 3.440 and 3.273Å. The crystals are pink, transparent, and have α 1.538, $\beta \approx 1.608$, γ 1.608, $2V_x$ 79° ; ext. angle against [001] is 11° on (100) and 11° on (010). Chudobaite is soluble in HCl: it is associated with conicalcrite, cuproadamite, and zinkolivenite. R. A. H.

ERKS (L. S.), BROOKS (E. J.), ADLER (L.), & MILTON (C.).

Electron probe analysis of minute inclusions of a copper-iron mineral. Amer. Min., 1959, **44**, 974-978, 2 figs.

The electron probe X-ray microanalyzer was applied to the study of 'valleriite' inclusions in chalcopyrite from the Mackinaw mine, Snohomish County, Washington. The inclusions were found to be different from type valleriite and are probably an undescribed sulphide. A. C. H.

RD (RICHARD C.), McALLISTER (JAMES F.), & ALMOND (HY). *Gowerite, a new hydrous calcium borate, from the Death Valley region, California.* Amer. Min., 1959, **44**, 911-919, 2 figs.

Gowerite ($\text{CaO} \cdot 3\text{B}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) occurs in the Furnace Creek borate deposits of Death Valley, California, and is associated with ulexite, meyerhofferite, ginorite, sassolite, and hydroboracite. It is named in honour of Harrison F. Gower. *Gowerite* has H.3, sp. gr. 2.00; it is monoclinic and optically biaxial (+), α 1.484, β 1.501, γ 1.550, $2V$ 63°, $n_c > n_e$. Analysis gave CaO 15.50, SrO 0.71, B_2O_3 58.10, H_2O 5.76, =100.07. Synthetic calcium hexaborate pentahydrate is identical with *gowerite*. Strong lines of X-ray powder patterns for both are 8.2, 4.11, 3.19 and 2.73 Å.

A. C. H.

IVKIN (N. M.), KITAIGORODSKY (I. S.), KOTELNIKOV (D. D.), & KOROLEV (YU. M.) ИВКИН (Н. М.), Китайгородский (И. С.), Котельников (Д. Д.) и Королёв (Ю. М.). Аналог алевардита (из Дагестана) [*An analogue of allevardite (from Daghestan)*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 554-563, 6 figs.

A mineral similar to *allevardite* was found as films lining cavities of a hydrothermal quartz vein near Mazada, Daghestan, Caucasus. It occurs as aggregates of flakes, light yellow to pearl white colour, sp. gr. 2.03-2.56, $H \approx 1$, n_α 1.528, γ 1.550, $2V(-)$ $14.5^\circ \pm 2^\circ$. Heating curve, dehydration curve and X-ray data are given. It is made of layers with a minimal period of two and it swells in glycerine. Chemical analyses A (by P. Y. Saldan) and B by I. I. Ivkin) are:

SiO ₂ as chem-bound	SiO ₂ as quartz	SiO ₂ as opal	Total SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO
47.42	1.10	1.21	49.73	0.02	33.57	2.52	0.86
46.79	1.10	1.21	49.10	tr.	33.45	2.51	0.85

MnO	MgO	CaO	K ₂ O	Na ₂ O	P ₂ O ₅	H ₂ O +	Total	H ₂ O -
0.03	n.f.	1.43	0.18	0.64	n.d.	10.70	99.68	7.50
tr.	n.f.	1.42	0.20	0.63	n.d.	12.10	100.26	6.76

S. I. T.

НЫРКОВ (А. А.) НЫРКОВ (А. А.). Сулунит — новый минерал из группы железистых хлоритов [*Sulunite—a new mineral of the ferruginous chlorite group*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 571-577, 2 figs.

Sulunite is a new mineral first found as a greenish film coating fossil plant remains, of Middle Carboniferous age, obtained in the core from a borehole in the Sulin region of the Donetz basin. Later this mineral was found in other localities. It is fibrous, green in colour, biaxial, positive, extinction || to fibres, α 1.574, β 1.595, γ 1.598, positive elongation, $2V$ 42°. Chemical analysis by P. P. Ovcharenko of a sample containing not more than 20% impurities (pyrite, calcite, carbonaceous matter) gave: SiO₂ 40.31, Al₂O₃ 28.69, Fe₂O₃ 12.82, FeO n.d., CaO 0.15, MgO 0.52, Na₂O 3.16, K₂O 4.00, SO₃ 0.77, ign. loss 7.82, =98.24. The d.t.a. curve shows endothermal stops at 50-200°C, 600°C, and 930°C and exothermal stops at 460°C. According to the X-ray data *sulunite* may be compared to *gumbelite*. [A.M. 45-478] S. I. T.

[KUKHARENKO (A. A.), KONDRATIEVA (V. V.), & КОВ-
ЯЗИНА (V. M.)] Кухаренко (А. А.), Кондратьева (В. В.) и Ковязина (В. М.). Кафетит — новый водный титанат кальция и железа [*Cafetite—a new hydrous calcium and iron titanate*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 444-453, 5 figs.

Cafetite (named after Ca, Fe, Ti) is a new mineral found in an ore pyroxenite from Africanda in the Kola peninsula, in association inmiarolitic cavities with sphene, chlorite, anatase, dysanallyte, ilmenite, and an undetermined mineral. It occurs in radial and moss-like aggregates, made of orthorhombic crystals, which studied by X-rays gave a 31.34 ± 0.05 kX, b 12.12 ± 0.03 kX, c 4.96 ± 0.01 kX, V 1884.01 kX. It is pale yellow to colourless, adamantine lustre, cleavage (520) prismatic, sp. gr. 3.82, H 4-5, α 1.95, β 2.08, γ 2.11, $2V$ (red) 39°, $2V$ (blue) 36.5°. Chemical analysis gave SiO₂ 1.00, TiO₂ 54.11, Al₂O₃ 2.02, Fe₂O₃ 22.00, FeO 0.49, MnO 0.20, MgO 1.44, CaO 6.23, Na₂O 0.28, K₂O 0.40, H₂O+ 8.83, H₂O- 3.46, =100.46, roughly corresponding to (Ca,Mg)(Fe,Al)Ti₄O₁₂·4H₂O. Thermal analysis suggests that it contains only water of crystallization given out at 100°C (one H₂O), 200-300°C (two H₂O), and 550-650°C (one H₂O). Only preliminary data is given for the associated undetermined mineral which appears to be a new type of a hydrous titanate of calcium. [A.M. 45-476, 479] S. I. T.

BAILEY (E. H.), HILDEBRAND (F. A.), CHRIST (C. L.), & FAHEY (J. J.). *Schuetteite, a new supergene mercury mineral.* Amer. Min., 1959, **44**, 1026-1038, 1 fig.

Schuetteite, HgSO₄·2HgO, named in honour of Curt Nicolaus Schuette, is found in quicksilver deposits in Nevada, California, Oregon, and Idaho. It is canary yellow, hexagonal, with unit cell a 7.07, c 10.9 Å, and sp. gr. 8.18. *Schuetteite* is uniaxial, negative, refr. ind. above 2.10 with birefringence moderate to high. A. C. H.

HUTTON (C. O.). *Yavapaiite, an anhydrous potassium ferric sulphate from Jerome, Arizona*. Amer. Min., 1959, **44**, 1105-1114, 2 figs., 6 tables.

Yavapaiite, $\text{KFe}^{3+}(\text{SO}_4)_2$, is a new mineral found in one specimen from the open pit of the United Verde Copper Mine, Jerome, Arizona, U.S.A. It occurs as pale pink, brittle, adamantine crystals, elongate parallel to [010], with perfect (100), (001), and distinct (110) cleavages, and strong conchoidal fracture. H . $2\frac{1}{2}$ -3, sp. gr. 2.88 (meas.), 2.92 (calc.); α 1.593, β 1.684, γ 1.698, with $2V_{\text{Na}}$ 30.5° (—), $r > v$ strong; $b \parallel \gamma$, $c : \alpha$ 6° , $a \parallel \beta$. *Yavapaiite* is monoclinic with a 8.12 ± 0.01 , b 5.14 , c 7.82 \AA , β $94^\circ 24'$; $a : b : c = 1.5797 : 1 : 1.5214$; the space group is $C2$, $C2/m$, or Cm . The mineral is associated with sulphur, voltaite, and unidentified sulphates; it is named for the Indian tribe that inhabits an area about Jerome.

B. H. B.

KNORRING (O. VON) & DEARNLEY (R.). *A note on a nordmarkite and an associated rare-earth mineral from the Ben Loyal syenite complex, Sutherlandshire*. Min. Mag., 1960, **32**, 389-391.

Nordmarkite from Lettermore quarry, on the shores of Loch Loyal, contains miarolitic cavities filled with a canary-yellow, kaolin-like, mineral in association with albitic plagioclase, apatite, and harmotome. Chemical analysis on 90 mg of the yellow mineral by O. von Knorring gave SiO_2 18.84, $\text{TiO}_2 + \text{Al}_2\text{O}_3$ 1.90, Rare Earths 32.00, Fe_2O_3 10.61, MnO 0.04, MgO 1.90, CaO 6.61, P_2O_5 15.87, ign. loss 6.51, H_2O — 6.06, $= 100.34$: it has sp. gr. ≈ 2.90 , mean refr. ind. 1.647. The X-ray powder pattern is similar to that of monazite and the mineral may be a distinct new hydrated species with a monazite structure, with Si partly

replacing P, and with Mg, Ca, and Fe partly replacing the rare earths; it is probably of low temperature hydrothermal origin. Chemical and modal analyses of the nordmarkite are also given.

R. A. H.

[GRIGORIEV (I. F.) & DOLOMANOVA (E. I.)] Григорьев (И. Ф.) и Долломанова (Е. И.). О геарксите [*On gearksite*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 185-186.

In 1951 the present authors [M.M. 31-960] described a new mineral under the name of gearksite. New analyses of this mineral show that it is gearksutite.

S. I. T.

MILTON (CHARLES) & INGRAM (BLANCHE). *Note on 'revordite' and related lead-sulfur-arsenic glasses*. Amer. Min., 1959, **44**, 1070-1076, 3 figs.

An X-ray amorphous phase close to $2\text{PbS} \cdot \text{As}_2\text{S}_3$ in composition with small amounts of Sb, Cd, and Zn occurs as botryoidal coatings on sphalerite and galena in the Quinivilca mine, La Libertad Department, Peru. Glasses of molar compositions $3.95 \text{ As}_2\text{S}_3 \cdot \text{PbS}$ and $2.00 \text{ As}_2\text{S}_3 \cdot \text{PbS}$ have been prepared by fusing mixtures of synthetic As_2S_3 glass and crystalline PbS at 1100°C in sealed evacuated silica glass tubes and quenching in water. The name *revordite* proposed by Amstutz, Ramdohr, and De Las Casas [Bull. soc. geol. Perú, **32**, 25-33, 1957; A.M. 43-794] for a natural Pb-S-As glass is considered untenable.

A. P.

See also: DUFFIN (W. J.) & GOODYEAR (J.), BRINDLEY (G. W.) & COMER (J. J.) for *hydroscaibroite* and *metascaibroite*, p. 496; SEMENOV (E. I.) for *hydropolythionite*, p. 499.

PHYSICAL PROPERTIES OF MINERALS

[CHESNOKOV (B. V.)] Чесноков (Б. В.). О люминесценции и внутреннем строении кристаллов циркона из Вишневых гор на Урале [*Luminescence and internal structure of zircon crystals from the Vishnevye Mountains in the Urals*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 583-586, 3 figs.

The luminescence of zircon disappears in altered crystals. Fresh crystals often show regular zones of strong luminescence revealing the internal structure of the crystals.

S. I. T.

CLAFFY (ESTHER W.) & GINTHER (ROBERT J.). *Red-luminescing quartz*. Amer. Min., 1959, **44**, 987-994, 1 fig.

Quartz which showed red cathodoluminescence was made by heating to 1200°C in a reducing atmosphere amorphous silicic acid containing minor amounts of Al^{3+} and Mn^{2+} .

The emission spectrum extended from 5400 to 7000 \AA . The maximum intensity occurred at 6500 \AA .

A. C. H.

MATUYAMA (EITARO). *Effects of heating on X-ray diffraction by carbons*. Nature, 1959, **184**, 544-545, 1 fig.

C. H. K.

TOWNSEND (J. R.), JEFFREY (G. A.), & PANAGIS (G. N.). *An experimental study of anomalous X-ray scattering by zinc sulfide and zinc oxide*. Zeits. Krist., 1959, **111**, 150-160, 3 figs.

Experimental measurements are reported on anomalous dispersion by single crystals of blende. The results are in agreement with theoretical calculations using angular independent anomalous-dispersion corrections for the atomic scattering factors. This supports the view that the

oretical difficulty with ZnO arose from having two identical anomalous scatters (Zn atoms) per primitive unit cell.

R. A. H.

VOLDÁN (J.). *Několik poznámek o viskozitě a proudění horninové taveniny* [Remarks on the viscosity and the flow of a rock melt]. *Silikáty*, 1958, **2**, 55–64, 5 figs., 2 tables.

Connection of the viscosity with the crystallization and the technological processing of a rock melt is explored. The dependence of log (viscosity) on temperature and on T of the following basaltic rocks is illustrated by several diagrams: basalt from Transcaucasia, diabase from Oloness, andesine-basalt from Gembudo, nepheline-basanite from Bohovany, Bohemia, and teschenite from Kursebi, U.S.S.R. The influence of the oxides Na_2O , MgO , CaO , Fe_2O_3 , and MnO_2 on the viscosity of the rock melt is studied. The results are evaluated for the use of industry, especially for dynamic casting of pipes.

J. K.

SEHNER (J.). *Viskozity tavených hornin při vysokých teplotách* [Viscosities of melted rocks at high temperatures]. *Silikáty*, 1959, **3**, 104–109, 1 fig., 4 tables.

Viscosities of basaltic rocks from Czechoslovak localities—Bohovany, Nová Baňa, Stráž, and Trmice—were measured by rotation viscosimeter with platinum coaxial cylinders. The results are compared with the data published by Russian and Japanese authors and are given in diagrams of temperature: log η .

J. K.

KEWARD (E. G.) & COOK (B. P.). *X-ray measurement of thermal expansion perpendicular to the layer planes of artificial and natural graphites*. *Nature*, 1960, **185**, 78–80.

Measurements have been made under the same conditions on a natural ordered graphite and on coke with a large proportion of turbostratic structure. Between room temperature and 1188°C the coefficient of expansion perpendicular to layer planes is largely independent of interlayer spacing and proportion of turbostratic structure, and is slightly dependent on temperature. At very low temperatures contraction is limited by the repulsion forces between adjacent layer planes, and structural imperfections become important.

D. McK.

BECK (ALAN E.) & BECK (JULIA M.). *On the measurement of the thermal conductivities of rocks by observations on a divided bar apparatus*. *Trans. Amer. Geophys. Union*, 1958, **39**, 1111–1123, 3 figs., 4 tables.

Thermal conductivities are given for 40 samples of plutonic rocks from drill holes in the Snowy Mts. area of New South Wales, Australia. The measured conductivities are compared with values computed from the modes of the

specimens. Error due to incomplete saturation of a specimen with water is discussed.

F. R. B.

GANESAN (S.) & SRINIVASAN (R.). *Specific heat and thermal expansion of fluorspar*. *Proc. Nat. Inst. Sci. India*, 1959, **25**, A, 139–163.

Specific heat and coefficient of thermal expansion of fluorite are calculated from an approximate vibration spectrum derived from a model of this crystal employed in calculating its elastic constants. Calculated values are in good agreement with the experimentally observed values.

A. P. S.

McKEWAN (W. M.). *Kinetics of iron oxide reduction*. *Trans. Metallurgical Soc. A.I.M.E.*, 1960, **218**, 2–6, 7 figs.

Iron-oxide pellets were reduced in hydrogen over a range of 0.07 to 0.97 atm. pressure and 400° to 1050°C. The rate of reduction per unit area is found to be constant with time and directly proportional to the partial pressure of hydrogen. The enthalpy of activation for the temperature range 400° to 550°C is 14,900 cal/mole and for the temperature range 600° to 1050°C 15,300 cal/mole.

R. G. Wls.

PANISH (M. B.). *The electrical conductivity of molten silica*. *Journ. Phys. Chem.*, 1959, **63**, 1337–1338, 1 fig.

The conductivity of very pure molten silica is 10^{-5} ohm $^{-1}$ cm $^{-1}$ at 1500°C, decreasing only slightly at 2500°C.

W. T. H.

ARGYRIADES (D.), DERGE (G.), & POUND (G. M.). *Electrical conductivity of molten FeS*. *Trans. Metallurgical Soc. A.I.M.E.*, 1959, **215**, 909–912, 2 figs.

The electrical conductance of molten FeS was studied as a function of temperature and composition. It was found that stoichiometric FeS (36.5% S) shows a minimum specific conductance of 400 ohm $^{-1}$ cm $^{-1}$. For the iron-rich melts the conductivity increases with increasing amount of iron to about 4850 ohm $^{-1}$ cm $^{-1}$ at 26% S. For the sulfur-rich melts the conductivity increases with increasing amount of sulfur until it reaches a maximum of 1300 ohm $^{-1}$ cm $^{-1}$ for 37.4% S and decreases to 800 ohm $^{-1}$ cm $^{-1}$ for 38.3% S. It is concluded that molten stoichiometric FeS is an intrinsic semiconductor in which the forbidden gap in the electron energy level diagram is quite narrow. Excess sulfur acts as an acceptor impurity in providing a component of positive hole conduction, while excess iron acts as a donor impurity to increase the n -type conduction.

R. G. Wls.

VOLDÁN (J.). *Elektrická termická analýza tavených hornin* [Electric thermal analysis of melted rocks]. *Silikáty*, 1959, **3**, 1–13, 13 figs., 1 table.

Electrical conductivities of six vitreously solidified samples of melted basaltic rocks were measured in an electric tubular oven by Pt-Pt/Rh thermocouple which was in contact with the sample pressed from finely crushed glass material. With a heating rate of 3°–4°C/min. crystallization of the minerals takes place at temperatures above 400–500°C. The crystallization has an influence on the electric conductivity of the sample. Simultaneously with the electric thermal a differential thermal analysis was made. The electric thermal curves show characteristic changes similar to those of the d.t.a. curves. The combination of these two methods makes possible better diagnosis of the newly crystallizing compounds during continuous heating of the silicate glass. The 6 rocks studied were olivine-basalt from Banská Baňa, olivine-basalt from Slapany, nephelinite from Heřmanice, melaphyre from Stará Paka, amphibolite from Nová Voletiny, and diabase from Ovčárna, all localities in Czechoslovakia.

J. K.

FRUEH (ALFRED J., Jr.). *The use of zone theory in problems of sulfide mineralogy, Part II: The resistivity of chalcopyrite*. Amer. Min., 1959, **44**, 1010–1019.

Resistivity/temperature measurements on chalcopyrite indicate a very small activation energy for donor impurities. In a sulfur-free atmosphere dissociation occurs at a lower level of thermal energy than does intrinsic semi-conductivity, suggesting a relatively large gap between the valence and conduction bands. Attempts to maintain equilibrium sulfur vapour pressure during resistivity measurement in order to obtain the exact gap energy were unsuccessful. Total absence of *p*-type conductivity was noted. This implies that chalcopyrite will not occur with a cation deficiency, but will deviate from stoichiometry only with a cation excess. [See also Geochim. Cosmochim. Acta, 1954, **6**, 79–89].

A. P.

LYNCH (A. C.). *The magnetic properties of ferrites*. Sci. Progress, 1957, **45**, 210–226.

M. H. B.

DU BOIS (P. M.), IRVING (E.), OPDYKE (N. D.), RUNCO (S. K.), & BANKS (M. R.). *The geomagnetic field in the Upper Triassic times in the United States*. Nature, 1957, **180**, 1186–1187, 1 fig.

C. H. K.

GIRDLER (R. W.). *Possible reversals of the earth's magnetic field in the Jurassic period*. Nature, 1959, **184**, 540–541, 1 fig.

C. H. K.

ARMSTRONG (D.). *Dating of some minor intrusions in Ayrshire*. Nature, 1957, **180**, 1277, 1 fig.

A palaeomagnetic study of the kyllites and crinanites in Ayrshire confirms that the former are Permian and the latter Tertiary.

C. H. K.

COOMBS (D. S.) & HATHERTON (T.). *Palaeomagnetic studies of Cenozoic volcanic rocks in New Zealand*. Nature, 1959, **184**, 883–884, 4 figs.

C. H. K.

NAGATA (T.) & UYEDA (S.). *Exchange interaction as a cause of reverse thermo-remnant magnetism*. Nature, 1959, **184**, 890–891, 2 figs.

C. H. K.

NAGATA (T.) & SHIMIZU (Y.). *Natural remanent magnetization of pre-Cambrian gneiss of Ongul Islands in Antarctica*. Nature, 1959, **184**, 1472–1473, 2 figs.

C. H. K.

BLUNDELL (D. J.) & STEPHENSON (P. J.). *Palaeomagnetic studies of some dolerite intrusions from the Theron Mountains and the Whichaway Nunataks, Antarctica*. Nature, 1959, **184**, 1860, 2 figs.

C. H. K.

HARLAND (W. B.) & BIDGOOD (D. E. T.). *Palaeomagnetic studies in some Norwegian sparagmites and the late pre-Cambrian ice age*. Nature, 1959, **184**, 1860–1862, 2 figs.

C. H. K.

ROCK-FORMING MINERALS AND PETROLOGY

Rock-forming minerals

BROUSSE (R.). *Remarques sur l'emploi, en pétrographie, des termes d'anorthose et de 'microcline-anorthose'*. Bull. Soc. franç. Min. Crist., 1959, **82**, 384–386, 1 fig.

It is suggested that the term microcline-anorthoclase (Fouqué, 1894) should be discarded. The usage of the term anorthoclase should not be based on the size of the optic axial angle, but rather on the chemical composition.

W. S. M.

BARTH (T. F. W.). *The inter-relations of the structural variants of the potash feldspars*. Zeits. Krist., 1959, **112**, 263–274, 5 figs.

The potassium feldspars are considered as having three modifications according to the amount of disorder with respect to Al and Si. The three modifications are: sanidine, monoclinic disordered; orthoclase, monoclinic paracrystal ordered; microcline, triclinic ordered. With these forms represented at the corners of a triangle various intermediate forms, many of which may be unstable, may

presented either on the sides of the triangle or within the triangle. The fully ordered form of microcline is considered to be stable below 270°C; at about 300°C some disorder becomes noticeable. Above 500°C completely disordered sanidine is stable.

W. S. M.

EICHA (GEORGES). *Examen de feldspaths des roches aux forts grossissements microscopiques*. C. R. somm. Soc. géol. France, 1958, **8**, 80–82.

The paper is concerned with observations on liquid inclusions.

E. J. & A. S.

ARSTENS (HARALD). *The origin of feldspar inclusions in the lamprophyres off Kristiansand, south Norway. A preliminary note*. Norsk Geol. Tidsskr., 1958, **38**, 245–252.

The lamprophyres are characterized by red vesicular inclusions which contain mainly red anorthoclase heavily loaded with a brown pigment. Needles of brown hornblende may protrude from the groundmass into the large vesicles giving them a composition analogous to large regular patches of leucocratic lamprophyre. The vesicles are commonly filled with a core of calcite and fibrous, radiating chlorite. Pyrite is frequently present. The lath-shaped feldspars are typically arranged in fan-like groups. The feldspar inclusions are concentrated towards the margins of the dykes. The size of the vesicular inclusions decreases towards the chilled contacts, and are largest (exceeding 5 mm in length) near the hanging wall. Amygdaloidal and ocellar structures are common in associated diabases in this region. The feldspar inclusions of the lamprophyres and the ocelli are considered to have a similar mode of origin, and are assumed to have formed at the magmatic stage. The lamprophyre literature is reviewed.

K. S. H.

OSBORNE (F. F.). *Chemical compositions of the Grenville and the southern part of the Timiskaming-Keewatin subprovince in Quebec*. Trans. Roy. Soc. Canada, sect. 4, 1956, **50**, 53–63, 4 figs., 2 tables.

The ratios of the normative feldspars of the plutonic rocks of Abitibi and of the Grenville subprovince are quite different. The Abitibi rocks are largely characterized by abundant modal albite or oligoclase; the Grenville rocks are more calcic. With the paragneisses included, the average composition of Abitibi rocks is displaced towards the Grenville average. The average of the Grenville region is less modified if the paragneisses are included, although it is displaced towards the Abitibi average. A tentative conclusion is that the averages of the Grenville and Abitibi rocks, particularly of the normative feldspars, are not far apart. It is probable that the properly weighted averages would show rocks about equally femic.

E. W. N.

RAO (S. V. LAKSHMI NARAYANA). *X-ray study of potash feldspar of the contact metamorphic zones at Gjelleråsen, Oslo*. Norsk Geol. Tidsskr., 1960, **40**, 1–12, 2 figs.

Potassium feldspar fractions from the Permian nordmarkite intrusion and from the country rock (Precambrian gneisses) at Gjelleråsen, Oslo, have been examined on X-ray powder diagrams. It is shown that disordering of the feldspars in the gneisses increases when approaching the nordmarkite contact. This increasing degree of disorder has been shown to depend upon the heat transfer across the contact.

K. S. H.

ISSHIKI (NAOKI). *Notes on rock-forming minerals (3). Red coloration of anorthite from Hachijo-jima*. Journ. Geol. Soc. Japan, 1958, **64**, 644–647, 3 figs.

Red colour of anorthite from Hachijo-jima, in the Izu Islands, is due to minute hematite inclusions. These disappear on heating at 920°C. Analyses and refr. ind. are reported for the red anorthite (A), and colourless anorthite (B) from the same lava, both analyses by M. Yamasaki.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	Na ₂ O	K ₂ O	Total	α	β	γ
A	43.02	35.28	1.45	20.06	0.39	0.02	100.22	1.576	1.582	1.586
B	43.87	35.41	0.84	19.76	0.30	0.04	100.22	1.575	1.583	1.588

Anal. (A) and (B) include: TiO₂ nil, n.d.; FeO nil, n.d.; MnO tr., n.d.; MgO tr., n.d. respectively.

A. P.

CHRISTIE (O. H. J.). *Note on the equilibrium between plagioclase and epidote*. Norsk Geol. Tidsskr., 1959, **39**, 268–271, 3 figs.

A tentative equilibrium diagram between plagioclase and epidote is presented where the effect of the subsolidus exsolution of plagioclase into peristerites is considered.

K. S. H.

HAYAMA (YOSHIKAZU). *Some considerations on the colour of biotite and its relation to metamorphism*. Journ. Geol. Soc. Japan, 1959, **65**, 21–30, 1 fig.

The TiO₂, Fe₂O₃, and FeO contents and colour of 95 biotites assembled from the literature are tabulated. On a plot of Fe₂O₃/(Fe₂O₃+FeO) [=x] against TiO₂ wt% [=y] four colour groups are distinguished by different marks. The systematic distribution of these marks shows that reddish brown colour is associated with high y and low x, dark brown to brown with lower y and higher x, yellowish to greenish brown with still lower y and somewhat higher x and green with very low y at any value of x. The possible influence of other constituents is briefly considered and the colour of biotite in relation to metamorphism discussed.

[M.A. 14–520]

A. P.

[FOSTER (MARGARET D.)] Фостер (Маргарет Д.). Зеленая слюда железорудной толщи Курской магнитной аномалии [Green mica from the iron ore series of the Kursk magnetic anomaly]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 729–730.

It is suggested that the green mica described by E. N. Sudovikova [M.A. 13-663] is similar to a mica described by M. D. Foster [Bull. U.S. Geol. Survey, 1956, 1036-D, 67-77] and is therefore similar to celadonite. S. I. T.

BANNO (SHOHEI). *Notes on rock-forming minerals (1). Magnesioarfvedsonite from the Bessi District.* Journ. Geol. Soc. Japan, 1958, 64, 386-387.

Magnesioarfvedsonite occurs in a thin layer along with carbonate (probably calcite), albite, hematite, chlorite, muscovite, alkali-amphibole, epidote, and quartz interbedded with layered schists probably transitional from the glaucophane-schist to the epidote-amphibolite facies. Analysis by H. Haramura gave SiO_2 48.68, Al_2O_3 7.56, TiO_2 0.24, Fe_2O_3 9.93, FeO 5.59, MnO 0.12, MgO 14.62, CaO 5.95, Na_2O 4.36, K_2O 0.29, $\text{H}_2\text{O} +$ 2.58, $\text{H}_2\text{O} -$ 0.45, $\text{P}_2\text{O}_5 < 0.02$, = 100.37; α colourless 1.645, β greenish blue 1.657, γ pale blue-green 1.660; $2V$ 33° - 40° ; $c:\gamma$ 27° - 31° . [M.A. 14-305] A. P.

SHIDO (F.) & MIYASHIRO (A.). *Hornblendes of basic metamorphic rocks.* Journ. Fac. Sci. Univ. Tokyo, sect. 2, 1959, 12, 85-102, 5 figs.

Five hornblendes from basic metamorphic rocks of the central Abukuma plateau in Japan and six hornblendes from Dalradian epidiorites of Perthshire and Kincardineshire, Scotland, have been separated and analysed, and the results are here presented together with optical data. Analyses by H. Haramura include those for brown hornblende (A), almandine (C) with a 11.63Å, both from a hornblende-garnet-clinopyroxene-andesine-quartz schist, Banchory, Deeside, Kincardineshire, and for blue-green hornblende (B), chlorite (D) with β 1.609, γ - α 0.009, d_{005} 2.831Å, d_{007} 2.022Å, both from a hornblende-chlorite-epidote-oligoclase schist, W.N.W. of Craigie, Perthshire. The relation between the composition of the hornblendes and the physical and chemical conditions of metamorphism are discussed.

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
A	40.90	1.84	13.09	2.90	17.81	0.22	7.50	11.56	1.30	1.13
B	45.19	0.54	12.74	2.25	9.60	0.24	13.79	11.62	1.33	0.42
C	35.91	0.96	22.13	1.73	25.04	1.87	1.89	10.13	0.08	0.10
D	26.50	0.20	23.08	1.59	14.49	0.15	22.17	0.28	0.19	0.00

	$\text{H}_2\text{O} +$	$\text{H}_2\text{O} -$	Total	α	γ	$2V_\alpha$	$\gamma:c$
A	1.75	0.00	100.09	1.660	1.692	66°	27°
B	2.11	0.00	99.88	1.637	1.663	81°	20°
C	0.46	0.14	100.44				
D	11.26	0.28	100.19				

Also included: (A) P_2O_5 0.09, (B) P_2O_5 0.05.

R. A. H.

BANNO (SHOHEI). *Notes on rock-forming minerals (10). Glaucophanes and garnet from the Kôtu district, Sikoku.* Journ. Geol. Soc. Japan, 1959, 65, 658-663, 3 figs.

Glaucophane schists of the vicinity of the Kôtu mine,

Tokushima Prefecture, are briefly described and the genesis of pyralpsite garnet in glaucophanitic metamorphism discussed. Chemical analyses by H. Haramura are presented for two amphiboles from schists at the Kôtu mine, 'sugilite glaucophane' (A), 'glaucophane proper' (B), and garnet (C) from the same rock as (B). Lawsonite and pumpellyite have not been observed in the source rocks.

	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
A	54.56	8.29	0.23	7.94	10.31	0.13	8.74	0.81	6.71	0.00
B	54.88	9.86	0.87	4.35	12.02	0.14	7.69	1.95	5.62	0.00
C	36.05	20.82	1.37	1.43	22.73	4.76	0.77	11.28	tr.	0.00
	$\text{H}_2\text{O} +$	$\text{H}_2\text{O} -$	P_2O_5	Total	α	β	γ	$2V$	δ	d_{10}
A	2.18	0.07	0.01	100.12	1.643	1.659	1.662	20°	γ	r_2
B	2.22	0.13	n.d.	99.82	1.633	1.651	1.654	34° - 38°	β	r_2
C	1.16	0.00	—	100.37	($a=11.63\text{\AA}$)					

[M.A. 12-272, 14-305]

A. P.

BANNO (SHOHEI). *Aegirinaugites from crystalline schists, Sikoku.* Journ. Geol. Soc. Japan, 1959, 65, 652-663, 4 figs.

Partial optical properties and analyses by H. Haramura are reported for two aegirinaugites; (A) from Hodono in the Bessi district, (B) from Bizan in the city of Tokushima, the source of recently analyzed magnesioriebeckite [M.A. 14-145].

	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
A	51.80	3.61	0.06	16.49	2.03	0.96	6.98	10.86	7.01	0.00
B	52.47	6.98	0.10	17.39	1.25	1.27	4.88	6.87	8.51	0.00
	$\text{H}_2\text{O} +$	$\text{H}_2\text{O} -$	P_2O_5	Total	β	$2V_\alpha$	$c:\gamma$			
A	0.43	0.08	<0.02	100.46	1.735	70° - 80°	10° - 20°			
B	0.43	0.00	<0.01	100.42	1.736	$70^\circ \pm 3^\circ$	$15 \pm 3^\circ$			

The mineral assemblages of aegirinaugite-bearing rocks and the stability of aegirinaugite with progressive metamorphism are discussed. [M.A. 14-305] A. P.

[DOVBRETSOV (N. L.)] Добрецов (Н. Л.). О взаимосвязи между главными ионами ромбических пироксенов и влиянии на оптические свойства минерала [On mutual relations between the principal ions of the rhombic pyroxenes and their influence on the optical properties of the mineral]. Зап. Всесоюз. Мин. Общ. [Mem. A. Union Min. Soc.], 1959, 88, 672-685, 1 fig.

Published analytical and optical data for forty pyroxenes were used as a basis for statistical study. Correlation coefficients were calculated for all possible couples of ratios (percentage of an element/total percentage of oxygen). This allowed calculation of the correlation formula between γ and Fe ion as $\gamma = 0.120 \text{ Fe/O} + 1.662$, and also between the percentage of FeSiO_3 in the pyroxene and number of the Fe and Mg ions, leaving CaSiO_2 to be determined from the table; the correlation formula is $n = 42.96\text{Fe}^{2+}/\text{O} - 98.62\text{Mg}/\text{O} + 50$. S. I. T.

BOWN (M. G.) & GAY (P.). *An X-ray study of exsolution phenomena in the Skaergaard pyroxenes.* Min. Mag. 1960, 32, 379-388, 4 figs.

By use of a routine method of single crystal X-ray investigation, about fifty pyroxenes from the Skaergaard intrusion

east Greenland) have been studied. Only one inverted geonite was found in which the augite retained the b and c axes of the original pigeonite crystal; this was from one of the lowest exposed rocks of the layered series. Augite crystals from various levels in the layered series from 0 to 300 metres were found to contain pigeonite sharing the (01) plane with the host augite and these pigeonites have apparently not inverted to orthopyroxene even although the host augite crystal had exsolved (100) orthopyroxene lamellae below the inversion temperature. Above 1800 metres only one augite crystal showed some exsolved geonite. Pigeonite lamellae occur in two orientations in the augite of the gabbro picrite. [M.A. 14-418] W. S. M.

YAROSHEVSKY (A. A.) ЯРОШЕВСКИЙ (А. А.). К вопросу о связи формы кристаллов гранатов с условиями минералообразования [*The connection between the shape of garnet crystals and the conditions of their formation*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 137-141.

This is a generalized survey of museum specimens of garnet-containing rocks and of literature, and shows that specimens containing particular forms of garnet crystals are definitely associated with certain types of rocks in which they are found. This, in its turn, suggests that their form may be related to the manner and environment of their formation.

S. I. T.

YAMASAKI (MASAO). *Notes on rock-forming minerals* (2). *Garnets from volcanic rocks*. Journ. Geol. Soc. Japan, 1958, **64**, 601-604.

Chemical analyses and cell dimensions are reported for two garnets: (A), by H. Haramaru, phenocrysts in garnet-quartz porphyrite, east of Nishinoumi, Yamanashi Prefecture; (B), by J. Ito, phenocrysts in garnet-biotite andesite, Nijô-san, Osaka Prefecture.

	SiO ₂	Al ₂ O ₃	TiO ₂	Fe ₂ O ₃	FeO	MnO	MgO	CaO	H ₂ O+	H ₂ O-	Total	a
(A)	36.63	22.63	1.42	2.80	25.77	2.12	3.13	5.00	0.29	0.20	100.32	11.57Å
(B)	37.65	20.62	1.33	nil	30.27	1.74	3.55	5.11	n.d.	n.d.	100.27	11.584Å

(A) and (B) include Na₂O 0.24, n.d.; K₂O 0.09, n.d., respectively.

The associations and genesis of the garnets are briefly discussed.

A. P.

YAMASAKI (MASAO). *Notes on rock-forming minerals* (4). *Blue and colourless kyanites from Tai-koang-ni, Korea*. Journ. Geol. Soc. Japan, 1958, **64**, 648-649.

Crystals of kyanite, up to 5 cm long, with andalusite and quartz in a vein in micaceous schists are partly bluish but mostly colourless. Optical orientation and refr. ind., 1.711, 1.721, 1.730, are the same in both parts. Analyses of the colorless and blue parts by the author gave respectively: SiO₂ 36.20, 36.40; Al₂O₃ 62.98, 63.33; total Fe as Fe₂O₃ 0.36, 0.28; Na₂O 0.14, 0.09; K₂O 0.21, 0.12; =99.89,

100.22; TiO₂, MgO, and CaO are absent. The K₂O may be attributed to a trace of muscovite contamination. No other elements could be detected by X-ray fluorescence spectrometer. The bluish tint disappeared from most of a kyanite grain after heating at 900°C in air for an hour, refr. ind. remaining unchanged.

A. P.

FRANCO (RUI RIBEIRO). *Sobre uma rocha com escapolita de Acopiára, Estado do Ceará*. Bol. Fac. Fil. Cien. Let., Univ. S. Paulo, 1955, **186**, Mineralogia no. 13, 111-118.

A calc-magnesian rock with scapolite is interpreted as a product of metamorphism and metasomatism. It contains also feldspars, diopside, clinozoisite, apatite, and sphene; the scapolite has ω 1.578, ϵ 1.555. Chemical composition of the rock is: SiO₂ 51.0, AlO₃ 17.3, Fe₂O₃ 0.6, FeO 0.9, MgO 6.8, CaO 18.3, Na₂O 2.7, K₂O 1.0, H₂O— 0.1, CO₂ 0.1, Cl 0.3, TiO₂ tr., SO₃ abs., F abs., P.F. 0.7, =99.8.

A. B. R.

KADOTA (OSAO). *The mineral glauconite from Fujikoto-mura, Akita Prefecture*. Journ. Geol. Soc. Japan, 1956, **62**, 145-150.

The glauconite in this area constitutes the greater part of the glauconitic sandstone interbedded in the lower Nanakura tuff. Refr. ind. of the glauconite are α 1.618-1.620, γ 1.649-1.652; sp. gr. between 2.6 and 2.7. Two chemical analyses of glauconite grains, one of green earthy cementing material of the glauconitic sandstones and one of glauconitic sandstone are reported. The composition of the glauconite is referred to as celadonic.

A. P.

FRANKS (PAUL C.). *Pectolite in mica peridotite, Woodson County, Kansas*. Amer. Min., 1959, **44**, 1082-1086, 2 figs.

Pectolite is a major constituent in the groundmass of one facies of the Hills Pond peridotite; optical and X-ray data confirm the identification. The occurrence of pectolite in this manner seems to be unique.

A. C. H.

Petrography : regional

SABINE (P. A.). *The geology of Rockall, North Atlantic*. Bull. Geol. Survey Gt. Britain, 1960, **16**, 156-178, 1 fig., 1 pl.

The petrology and mineralogy of specimens collected by a party from H.M.S. *Vidal* in 1955 are described. The major part of Rockall is aegirine-granite (A, B); modal anal. are given. Riebeckite (C), separated from (A), has α 1.678, β 1.687, γ 1.692; $2V_{\alpha} \approx 72^\circ$, $\alpha : c$ 9° . Approx. chem. anal. are given for aegirine (D) and acmite (E) separated from (A); aegirine has α 1.761, β 1.799, γ 1.817, $2V_{\alpha} \approx 60^\circ$, $\alpha : c$ $3-5^\circ$; acmite refr. ind. slightly higher, $2V_{\alpha} \approx 60^\circ$, $\alpha : c$ slightly higher than for aegirine. Other minerals from

aegirine-granite are microcline, α 1.518, β 1.523, γ 1.527, $2V_{\alpha}$ 79.5°; albite, α 1.529, β 1.533, γ 1.540, $2V_{\gamma}$ 78.5°; quartz, cristobalite; elpidite, α 1.560, γ 1.568, $2V_{\gamma}$ variable; a mineral of the rinkite group, α 1.673, γ 1.685, $2V_{\gamma}$ 8°; and a mineral possibly related to the eucolite-eudialyte series, nearly isotropic, n 1.571; and minor amounts of pyrochlore, monazite, xenotime, and zircon. X-ray powder and spectrographic data are given for some of the above minerals, together with some spectrographic determinations on the aegirine-granites (A, B) and on a specimen of rockallite. Both microcline and albite show unusual twinning which was examined by universal stage methods.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O+	H ₂ O-
A	71.62	8.13	6.27	1.84	0.04	0.23	4.69	5.31	0.36	0.23
B	70.31	7.53	8.32	2.44	0.02	0.35	5.26	4.19	0.27	0.16
C	50.3	0.7	9.9	24.4	0.3	0.6	8.8	1.7	1.3	nt.f.d.
D	50±4	1½±½	27±2	1.8±0.2	tr.	6.1±0.3	10-15	nt.f.d.	—	—
E	50±4	1½±½	32±2	0.6±0.2	tr.	2.5±0.3	10-15	nt.f.d.	—	—

	TiO ₂	P ₂ O ₅	MnO	CO ₂	ZrO ₂	S	BaO	ThO ₂ , Y ₂ O ₃ , rare earths	Total
A	0.19	0.36	0.10	nt.f.d.	0.34	0.03	0.04	0.08	99.86
B	0.26	0.33	0.15	nt.f.d.	—	0.02	0.02	0.02	99.65
C	0.8	n.d.	0.6	n.d.	0.04	n.d.	0.006	tr.	99.4
D	0.8±0.05	n.d.	0.1	n.d.	<0.1	n.d.	nt.f.d.	tr.	—
E	0.3±0.05	n.d.	0.5	n.d.	<0.1	n.d.	nt.f.d.	tr.	—

Small amounts of Ca, Nb, Sr, Sn, B in (A); Ga, Nb, Sr, Zr, Sn, B in (B); Nb, Th, Ba, V, Ni in (C); Nb, Ba, Sr, V in (D) and (E).

R. D.

BUIST (D. S.). *The composite sill of Rudh' an Eireannaich, Skye*. Geol. Mag., 1959, **96**, 247-252.

The upward sequence through the sill is given as lower basalt, hybrid zone, felsite, hybrid zone, upper basalt. Gabbroic segregations in the basalt contain labradorite (An₅₃) and augite (Ca₃₈Mg₃₇Fe₂₅); the basalts contain calcic andesine (An₄₀₋₄₆) and augite; the outer margins of the thin hybrid zones contain sodic andesine (An₃₅) and a pigeonitic pyroxene ($2V$ 22°, β 1.706, Ca₂₁Mg₃₉Fe₄₀). New chemical and spectrographic rock analyses are given.

W. J. W.

MYKURA (W.). *The Lower Old Red Sandstone igneous rocks of the Pentland Hills*. Bull. Geol. Survey. Gt. Britain, 1960, **16**, 131-155, 5 figs.

R. D.

EWING (C. J. C.) & FRANCIS (E. H.). *No. 3 off-shore boring in the Firth of Forth (1956-1957)*. Bull. Geol. Survey Gt. Britain, 1960, **16**, 48-68, 2 figs.

Basalt lava and tuffs occur in the lower part of a Coal Measures succession. X-ray examination by P. A. Sabine and B. R. Young indicates the presence of feldspar and chlorite in the lapilli.

R. D.

RAO (M. SRIRAMA). *Minor acid intrusions and dykes of Lamash-Whiting Bay region, Arran [Scotland]*. Geol. Mag., 1959, **96**, 237-246.

Minor intrusions of acid, basic, and hybrid intermediate composition are taken to indicate the contemporaneous availability of acid and basic magma. A new chemical analysis of an orthopyroxene-bearing pitchstone is given [M.A. **14**-210]

W. J. W.

KRAUSKOPF (KONRAD B.). *Igneous and metamorphic rocks of the Øksfjord area, Vest-Finnmark*. Norges Geol. Unders., 1954, **188**, 29-50, 1 fig., 1 geol. map.

The rocks of the Øksfjord area in northern Norway constitute a mafic and ultramafic complex. The band gabbro, making up much of the complex, which in composition and texture resembles rocks generally thought to be intrusive, shows fairly convincing evidence of metamorphic origin. On the other hand, peridotite and anorthosite, for which an origin as intrusive magmas is commonly considered unlikely, give clear evidence of intrusive relations.

A. P.

TOMKEIEFF (S. I.). *The Oslo petrographical province*. S. Progress, 1957, **45**, 429-446, 7 figs.

A summary statement of work up to 1933 (Brøgger's 1914 paper) is followed by a compact review of the more recent work by the present generation of Norwegian petrologists. The illustrations, with one exception, are from the published papers.

M. H. B.

STÅLHÖS (G.). *En bäddformig jotnisk diabas i norra Västmanlands län*. Geol. Fören. Förh. Stockholm, 1958, **80**, 55-60, 1 fig.

An almost horizontal intrusion of Jotnian dolerite was found in the tunnels of an underground hydroelectric power station in northernmost Sweden. The dolerite, thickened to 8 to 15 metres, is intruded into veined gneisses and granites of Middle Archaean age. The mineral composition is given.

P. Lggn.

ALSAC (C.). *Étude pétrographique des pillow-lavas de la pointe Guilben, près de Paimpol (Côtes-du-Nord)*. Bull. Soc. franç. Min. Crist., 1959, **82**, 363-366, 2 figs.

Spilitic pillow lavas occur interstratified with pre-Cambrian volcanic tuff at Guilben point, near Paimpol, Brittany. These spilites consist essentially of the low temperature assemblage: chlorite, epidote, and low temperature albite. The matrix between the pillows consists of albite and magnetite in a chloritic mesostasis together with carnelian. The minerals of the pillows are considered to be essentially primary.

R. A. H.

BARBIER (REYNOLD) & MICHEL (ROBERT). *Découverte d'une roche volcanique (andésite) dans la zone du Flysch des Aiguilles d'Arve*. Bull. Soc. géol. France, 1958, **8**, 712-714.

This Tertiary andesitic flow is probably submarine, and the second appearance of this type of rock in the eastern Alps, the first having been described by Bellair. These rocks might be the source of the eruptive material in the Eysch sandstones.

E. J. & A. S.

GENEVOY (MAURICE). *Sur l'importance et les caractères du paléovolcanisme en Limousin septentrional (Massif Central français)*. Bull. Soc. géol. France, 1958, **8**, 113-122.

Evidence of vulcanism is met quite frequently in the crystalline schists of Limousin. The volcanic rocks form an association of spilites and keratophyres rich in soda, poor in potash. Amphibolites intercalated in the same schists are mainly of intrusive origin.

E. J. & A. S.

FRONZ (HANS JOACHIM). *Das Migmatitgebiet des 'Winnebachgranits' (Ötztal-Tirol) als Beispiel einer petrotektonischen Analyse*. Tscherma's Min. Petr. Mitt., 1959, ser. 3, **7**, 1-69, 20 figs., 1 geol. map.

A petrofabric study, forming a Ph.D. dissertation, of the anar and linear elements in the migmatite and granite of the Winnebach, Tyrol, and in the surrounding rocks. The results are shown in part by 67 petrofabric diagrams plotted on a large scale geologic map.

A. P.

AMPRECHT (J.). *Zur Petrographie des Migmatitgebietes von Ruhla (Thür. Wald)*. Wiss. Zeits. Univ. Halle, Math.-Nat., 1960, **9**(1), 131-142, 11 figs., 1 folding sketch-map.

The Ruhla granite is intrusive but on the evidence of distinct textures and mineral generations is regarded as a hybrid paligenetic rock and as the K-metasomatized equivalent of the Brotterode migmatite. The intrusion followed on the main phase of the Variscan orogeny. Biotite-migmatites and granitic gneisses developed by a K-metasomatism from early Palaeozoic sediments which had been converted to quartz-mica-schists and amphibolites in pre-Variscan times.

J. Ph.

AEDEKE (R.). *Beiträge zur Petrographie der porphyrischen Gesteine im Mitteldeutschland*. Wiss. Zeits. Univ. Halle, Math.-Nat., 1960, **9**(1), 115-130, 9 figs., 1 pl.

Younger quartz-porphyrines and older amygdaloidal granite-porphyrines are in some cases proved to be lavas of Permian age. Modal analyses are given. The paper is concerned largely with stratigraphical correlation.

J. Ph.

ČISAŘ (ZDENĚK). *Zur Altersfrage der kristallinen Serien und ihrer Metamorphose im Kopernik-Gewölbe in Hohen Gosenke (Mähren)*. Neues Jahrb. Geol. Paläont., Abhandl., 1958, **106**, 277-292, 2 figs., 4 pls.

The crystalline rocks of the Kopernik dome in Moravia can be divided into a central, Proterozoic, series and a peripheral, Devonian, series. Chemical analyses of the migmatitic rocks of the central series are represented by a diagram of their Niggli values.

A. P.

[POLKANOV (A. A.)] Полканов (А. А.). Проблема происхождения гранитов платформенных областей и геология, магматизм и граниты эпохи Хогландия-Иотния южной части Балтийского щита [*The problem of the origin of granites of the platform regions and the geology, magmatism and granites of the epoch Hoglandian-Jotnian of the southern part of the Baltic Shield*]. Тр. Лаб. Геол. Докембрия [Trans. Lab. Geol. Precambrian], 1955, **5**, 5-43.

— Геология Хогландия-Иотния Балтийского щита (стратиграфия, тектоника, кинематика и магматизм) [*The geology of the Hoglandian-Jotnian of the Baltic Shield (Stratigraphy, tectonics, kinematics and magmatism)*]. Тр. Лаб. Геол. Докембрия [Trans. Lab. Geol. Precambrian], 1956, **6**, 122 pp. Price 7r. 20k.

As described by the titles these two articles present a detailed geological history of the Baltic Shield during the Upper Proterozoic era, including orogenesis, metamorphism, and magmatism. Special attention is paid to the formation of magmatic subcrustal reservoirs and to the origin of various magma types. Modern literature dealing with this area and problems, connected with it, are discussed.

S. I. T.

[POLKANOV (A. A.) & ELISEEV (N. A.)] Полканов (А. А.) и Елисеев (Н. А.). Петрология плутона Гремяха-Вырмес, Кольский полуостров [*Petrology of Gremyakh-Vyrmes pluton, Kola peninsula*]. Изд. Лен. Гос. Унив. [Publ. Leningrad State Univ.], 1941, 244 pp., 48 figs., 5 pls. Price 32r.

This monograph contains a most detailed petrological description of a large number of rock types entering into the composition of the Gremyakh-Vyrmes banded igneous intrusive complex, which is situated in the northern part of the Kola peninsula (about 68°45'N, 32°30'E). In plan the intrusion is elliptical with its longer axis, some 20 km in length, stretching NNW-SSE, and its shorter axis some 6 km in length. It is intruded into a gneiss complex of pre-Cambrian age, but the intrusion may prove to be of a post-Devonian age. A striking feature of this complex is that all its component rocks, varying from ultrabasic (peridotites) to acid (granites), have a directional structure which varies from trachytoidal texture to a coarsely banded structure. Three main intrusive phases are distinguished: (I) ultrabasic-basic-intermediate, subdivided into three series; A, hortonolite peridotite, gabbro, anorthosite, B,

peridotite, alkali gabbro, akerite, pulsaskite, C, syenite and pegmatite veins; (II) melteigite-jacupirangite, melteigite, ijolite, urtite series accompanied by various syenites, such as malignite, akerite, juvite, and foyaite; (III) granite-nordmarkite series. Among the rocks of the second phase occurs an aegirinite containing crystals of aegirine up to one metre in length. Several chemical analyses of these rocks are given, recalculated and plotted on various diagrams. The genesis of the rocks is discussed in great detail and various suggestions are made and compared among themselves. It is suggested that the plutonic intrusion represents a subvolcanic intrusion in the kratogen comparable to certain intrusions found in the Oslo district. The diversification of the rocks is attributed to a gravitational crystallisation and to the movement of the crystallising magma, which was near basaltic in composition. It is also suggested that the jacupirangite-urtite series may have been formed from a residual magma enriched in alkalis and volatiles. These volatiles may have been also responsible for the allometasomatism of the country rocks and autometasomatism of the igneous rocks. S. I. T.

MARMO (VLADI). *Orthoclase and microcline granites*. Amer. Journ. Sci., 1958, **256**, 360-364.

Some granites contain orthoclase, others only microcline. The former are held to be mainly postkinematic, the latter mainly synkinematic. Orthoclase may form when emplacement is rapid, microcline when it is more protracted. [M.A. 13-411, 14-64] A. P.

[BUTURLINOV (N. V.) & PANOV (B. S.)] Бутурлинов (Н. В.) и Панов (Б. С.). Об изверженных породах и рудной минерализации Донецкого бассейна [*Igneous rocks and ore mineralization of the Donetsk Coal Fields*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 419-429, 2 figs.

Intrusive rocks, probably of a Jurassic age, are described. The earlier set contains shonkinite, monzonite, and varieties of lamprophyres, while the later set is represented by various andesitic rocks. Seven chemical analyses of rocks are given. Hydrothermal sulphide ores including rich antimony-mercury deposits are apparently genetically related to the intrusive rocks, and the isotopic analysis of lead from these deposits suggests that the ores are Jurassic in age. S. I. T.

POLLETT (J. D.). *Report of the Geological Department for 1957, Sierra Leone*. 1959, 16 pp.

Pp. 7-9: Syenites in the valley of the Maho are predominantly albite or oligoclase, perthite, and nepheline rocks with or without sodalite, brown or green biotite, cancrinite, magnetite, zircon, pyrochlore, and apatite. Associated younger granite consists of perthitic microcline,

sodic-plagioclase, quartz, and biotite. Purple fluorapatite and hematite occur near the granite margin. Banded ironstone at the granite contact has recrystallised and become radioactive. West of the Maho, sillimanite-garnet-quartzite is interbedded with granulite and ironstone. The syenites and granite intrude gabbro dykes which may be related to the Colony basic rocks.

P. 9: Synkinematic granodiorites in the north end of the Kambui hills contain bodies of talc-chlorite schist, hematite schist, olivine-tremolite-pyroxene schist, pyroxene and epidote amphibolites, diorite, gabbro, and cumulate tonite-garnet-magnetite-quartz schist.

Pp. 9-11: Rocks of the Kasila system are of granulite facies and are cut by dolerites. Basic gneisses form narrow zones in quartz-feldspar-garnet gneiss in which broad zones are characterised by graphite, garnet, biotite, pyroxene and concordant pegmatites. Three garnets had MnO 0.045, and 0.45; the last contained Cr₂O₃ 0.10. K. C. H.

BATES (D. A.). *Report of the Director for 1956-1957, Ghana Geological Survey*. 1958, 20 pp.

P. 13: Nepheline-syenite gneisses in the Dahomey near Senchi contain allanite and pyrochlore. Analysis of the syenite gives SiO₂ 57.07, Al₂O₃ 22.86, Fe₂O₃ 2.22, H₂O 0.74, MgO 0.13, CaO 1.07, Na₂O 8.60, K₂O 5.33, H₂SO₄ 1.53, H₂O—0.28, TiO₂ 0.23, =100.06. K. C. H.

HAZELL (J. R. T.). *The Jakura marble, Kabba province, Nigeria*. Rec. Geol. Surv. Nigeria for 1956, 1958, 38-45, 3 figs.

Marble (grain size 0.5-3.5 ins.) is interbedded with gneisses and quartzite and consists of calcite with minor inclusions of graphite, quartz, and mica. Some contact zones are rich in quartz and mica and carry small cubes of pyrite. One calcisilicate band cutting the marble consists of diopside and oligoclase with a vesuvianite zone at the contact; another contains (in order of abundance) hematite, blende, feldspar, phlogopite, diopside, sphene, and apatite. At the margin a small amount of quartz and vesuvianite is followed by a thick band of euhedral vesuvianite. Analysis of the marble:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	CaO	SO ₃	P ₂ O ₅	Ign. Loss	Total
A	0.68	0.16	0.04	0.48	55.16	tr.	tr.	43.59	100.00
B	0.58	0.15	0.08	0.45	55.28	tr.	tr.	43.58	100.00
C	0.85	0.15	0.11	0.48	55.15	tr.	0.01	43.52	100.00

The neighbouring Mimi River clay contains a small quantity of sericite and up to 10% of fine sand and is composed mainly of quartz and iron oxides; average analyses of the clay: SiO₂ 57.62, Al₂O₃ 17.82, Fe₂O₃ 7.7, MgO 1.43, CaO 1.28, Na₂O 1.08, K₂O 2.73, TiO₂ 1.1, P₂O₅ 0.05, MnO 0.13, SO₃ 0.03, ign. loss 9.79, [=100.00]. K. C. H.

SIMPSON (E. S. W.) & TREGIDGA (J. A.). *The Archaean rocks of the Marble Delta district, Natal*. Trans. Geol. Soc. South Africa, 1956, **59**, 22 pp., 5 figs., 1 pl.

petrological account is given of an area in which a large formed block of crystalline dolomitic marble with associated minor quartzites and amphibolites is surrounded and invaded by granites and gneisses which are in part charnockitic. Forsterite and diopside occur in the marbles in siliceous impurities, and near some tongues of intrusive granite wollastonite assemblages are developed. Aluminous impurities have recrystallized to form pink spinel (n 1.719) and phlogopite; chondrodite also occurs. The surrounding gneisses are mainly coarse to medium-grained grey gneissose charnockitic granites, often garnetiferous. The charnockitic rocks occur in the Oribi Gorge and include coarsely porphyritic, medium-grained, and granulitic varieties [M.A. 14-154]. A porphyritic fayalite-augite granodiorite has green plagioclase phenocrysts (An_{31}), brown fayalitic olivine ($2V_{\alpha}$ 51° , 1.860 , Fa_{93}) and pale green clinopyroxene ($2V_{\gamma}$ 54° , 1.742). Chemical and modal analyses are given for 12 rocks.

R. A. H.

TUN (P.). *Sur quelques filons basiques d'âge posturundien de Kalima (Maniema)*. Ann. (Bull.) Soc. géol. Belgique, 1958-1959, **82**, B363-377, 3 figs.

Analyses of three rocks are given. They form dykes cutting the granite of Kalima and its metamorphic aureole. The Urundian rocks, have a considerable content of olivine and represent an undersaturated, basic magma. (A) basalt from Kalima, anal. M. Camus and G. Ledent; (B) olivine diabase from Yubuli (Maniema), anal. P. Haniset; (C) kaolinized basalt from Yubuli, anal. Geol. Survey of the Congo.

SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	CaO	Na ₂ O	K ₂ O	H ₂ O+	H ₂ O-
44.23	14.29	3.55	7.47	7.50	8.62	0.96	3.70	2.75	0.24
44.28	11.10	2.53	9.92	11.28	7.49	2.00	0.75	3.33	—
47.50	29.50	1.55	—	1.05	0.00	n.d.	n.d.	9.40	2.30

TiO ₂	P ₂ O ₅	MnO	CO ₂	S	Insol. in HF	Total
2.05	0.66	0.17	3.47	present	—	99.66
1.73	0.04	0.12	5.00	—	—	99.57
3.75	—	—	—	—	2.61	97.66

J. M.

BERGER (ANDRÉ). *Les granites stratoïdes du pays des betsiles (Madagascar)*. Bull. Soc. géol. France, 1958, **8**, 537-554.

Bodies of granite outcropping in the south-west centre of Madagascar are often interleaved with the crystalline gneisses and generally have a foliated structure which can become a coarse ribbon structure and produce a migmatitic texture of the rock. The texture is granoblastic; perthitic microcline surrounds the plagioclase grains; new quartz is abundant, and myrmekite always present. The granitic gneiss is alkaline while the migmatitic is calcalkaline. Chemical comparison with the surrounding gneiss by Leitch's method shows that granitization results from an alkaline metasomatism of the gneiss; the changes affect

only 6 to 12% of the cations of the standard cell. The granites probably belong to the Eocambrian orogenesis. The study is a preliminary one. Ten chemical analyses are given including: (A) granite from Midongy, (B) migmatite from Amborompotsy, (C) gneiss from Midongy.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O+	H ₂ O-	Total
A	74.60	12.00	2.02	0.80	0.54	0.88	3.35	4.78	0.05	0.25	99.69
B	67.70	13.79	1.30	3.00	1.70	3.00	3.65	4.50	0.20	0.20	99.74
C	72.00	11.85	1.75	2.05	2.60	2.75	3.20	2.10	0.50	0.20	99.93

A, B, and C include: TiO₂ 0.36, 0.50, 0.60; P₂O₅ tr., 0.10, 0.25; MnO 0.06, 0.10, 0.08, respectively.

E. J. & A. S.

DELBOIS (LÉON). *Les charnockites basiques du massif des Vavato (Madagascar)*. C.R. somm. Soc. géol. France, 1958, **8**, 300-302.

There is a passage from charnockite (granulite facies) to amphibolite. Two analyses of the charnockites are given: A, of norite composition, SiO₂ 49.25, Al₂O₃ 10.20, Fe₂O₃ 2.80, FeO 7.60, MnO 0.10, MgO 20.95, CaO 6.20, Na₂O 1.55, K₂O 0.45, H₂O+ 0.15, H₂O- 0.10, Ti₂O 0.45, P₂O₅ —, =99.80; B, of gabbro-norite composition, SiO₂ 45.20, Al₂O₃ 19.50, Fe₂O₃ 2.45, FeO 10.45, MnO 0.10, MgO 6.70, CaO 10.00, Na₂O 2.85, K₂O 0.35, H₂O+ 0.40, H₂O- 0.15, TiO₂ 1.25, P₂O₅ 0.20, =99.60.

E. J. & A. S.

BORDET (PIERRE). *A propos des 'ignimbrites'*. C.R. somm. Soc. géol. France, 1958, **8**, 77-80.

Ignimbrites are exceptional at Esterel. Discussions.

E. J. & A. S.

SCHÜRMANN (H. M. E.). *Massengesteine aus Ägypten. Achzehnter Teil. Die präkambrischen Gneise und Schiefer im nördlichen Teil der östlichen Wüste*. Neues Jahrb. Geol. Paläont., Abhandl., 1958, **107**, 103-136, 9 figs., 6 pls., 1 colour pl. *Neunzehnter Teil. Präkambrische Kristalline Schiefer und Gneise der östlichen Wüste zwischen 28° 30' und 27° 30' nördl. Breite*. Op. cit., 1959, **108**, 127-149, 9 figs., 2 maps, 5 pls.

These are the 18th and 19th instalments of a series of reports on the massive rocks of Egypt begun in 1937. In the former, dealing with gneisses and schists in the northern part of the eastern desert, new chemical analyses are reported for a gneiss, a riebeckite granite, and a granite. In the 19th instalment three new analyses of granite gneisses from the high mountains of the eastern desert are reported. The six analyses just mentioned constitute analyses number 100 to 105 reported in this series. The Niggli values for these are included in a table covering analyses 89 to 105, in continuation of the tabulation in the 7th instalment. The weight percentages of zircon, monazite, orthite, and thorite, in over 80 different granitic rocks from Egypt are reported in a table.

A. P.

KANÔ (HIROSHI). *Petrology of an aplite dyke from Iwaizumi, Northern Kitakami-mountainland—with special reference to the origin of the diversity of the Tanohata granitic mass.* Journ. Geol. Soc. Japan, 1959, **65**, 227–234, 7 figs., 1 pl.

The nature of the parent granodioritic rock of the aplite, metamorphism of the adjacent rocks, and the mineralogical and textural features of the dyke are discussed. A. P.

STEWART (DUNCAN). *Petrography of some erratics from Cape Royds, Ross Island, Antarctica.* Amer. Min., 1959, **44**, 1159–1168, 1 table.

Modal analyses are given for sections of 66 igneous rocks, all erratics, collected from Cape Royds, Ross Island, Antarctica, during the British Antarctic Expedition of 1907–1909. A list is given naming the igneous and metamorphic rocks represented in the suite of 169 thin sections.

B. H. B.

SUBRAMANIAM (A. P.). *Charnockites of the type area near Madras—a reinterpretation.* Amer. Journ. Sci., 1959, **257**, 321–353, 3 figs., 3 pls.

Relations of the rock units in the type charnockite area, near Madras city, are described and the terms 'charnockite' and 'charnockite series' redefined. The 'acid' division of the charnockite series of Holland, composed of alaskites, birkremites, enderbites, and hypersthene quartz syenites, is considered to be an igneous suite which has undergone metamorphic reconstitution and recrystallization with concomitant changes in mineralogy, such as unmixing of feldspars and formation of garnet. The rocks of the 'basic' division of Holland are essentially pyroxene granulites and variants which have no genetic relation to the charnockites *sensu stricto*. Sporadic exposures of norite with pyroxenite layers and lenses are considered syntectonic lenses, unrelated to the charnockite suite. Rocks of Holland's 'intermediate' division grade from homogeneous hypersthene diorites to charnockite-pyroxene granulite migmatites, and are hybrids resulting from partial assimilation and incorporation of pyroxene granulite by the charnockitic magma. Garnetiferous sillimanite gneisses (khondalites) are also developed in force in the area; Holland's leptynites are inferred to be a thoroughly reconstituted facies of khondalite. Similar associations of rocks are found in the larger massifs of southern India, such as those of Nilgiri, Shevrov, and Palni. [M.M. 31–565; M.A. 13–351]

A. P.

Petrology : Structural

HARRIS (A. L.) & RAST (N.). *Oriented quartz inclusions in garnets.* Nature, 1960, **185**, 448–449.

Garnets from the central Highlands of Scotland with an S-shaped arrangement of inclusions contain included quartz grains of three types, (i) crescentic inclusions near the centre

of the garnet, which are polygonized grains retaining a microscopic deformation texture, (ii) larger elongate inclusions, which have recrystallized with their c-axes parallel to their length, (iii) larger equi-dimensional grains peripherally disposed, which show strain shadows due to removed post-movement deformation.

D. McK

CRAMPTON (C. B.). *Muscovite, biotite and quartz fabric reorientation.* Journ. Geol., 1958, **66**, 28–34.

Petrofabric analyses of specimens from the Moine schists of the northwest Highlands of Scotland indicate that quartz can reorient more rapidly and under lower strain conditions than either biotite or muscovite. The data further suggest that biotite acquires a new preferred orientation more rapidly than muscovite.

H. L.

HJERN (P.-G.). *Tektonische Studien in zwei småländiska Gebieten.* Geol. Fören. Förh. Stockholm, 1958, **80**, 186–189, 4 figs.

A number of tectonical analyses are reported from five districts along the tectonized zone between southwestern and southeastern Sweden. The age relations of the tectonization along the border line should be expressed as mylonitization and not as protoginization, as has been done hitherto.

P. Lgg

BROTZEN (O.). *Outline of mineralization in zoned granitic pegmatites. A qualitative and comparative study.* Geol. Fören. Förh. Stockholm, 1959, **81**, 1–98, 30 figs.

Zoned granitic pegmatites are divided into four groups: simple, muscovitic, late albitic, and lithium-bearing. The genesis of the zoned pegmatites is approached from a magmatic point of view. The temperature, pressure, and bulk composition of pegmatitic systems are discussed. The pegmatitic crystallization is explained as a consequence of low magmatic temperatures: low energy content and pressure nucleation. The crystallization of quartz is explained as being caused by immobilization of silica due to increased activity of CO₂. Muscovite indicates increased activity of H₂O and CO₂. Alkali replacement is caused by supersaturation and by changes in stability relations upon appearance of an aqueous, carbonated phase. The interpretation is also extended to cover reversed zoning and occurrence of minor minerals. The mechanism of chemical differentiation of pegmatites is discussed.

P. Lgg

BROTZEN (O.). *Mineral-association in granitic pegmatites. A statistical study.* Geol. Fören. Förh. Stockholm, 1959, **81**, 231–296, 7 figs., 21 tables.

A number of typical accessory minerals (allanite, gadolinite, topaz, beryl, tourmaline, monazite, apatite, triplite,

phylite, lithiophilite, amblygonite, euxenite, fergusonite, protantalite, columbite, tantalite, cassiterite, and microcline) of granitic pegmatites are studied statistically with respect to their association with common pegmatite minerals (feldspars, micas, quartz, petalite, and spodumene). The material of the study comprised the main collection in the Mineralogical Department of the Swedish Museum of Natural History. Mineral identification was made by visual inspection. The results are given as diagrams and in the form of tables of primary observations. The importance of collecting minerals in their natural matrix is stressed.

P. Lggn.

ROTZEN (O.). *On zoned granitic pegmatites*. Stockholm Contributions in Geology, 1959, **3**, 71–81.

The paper is a review of two earlier papers by the author [see preceding abstracts]. Zoned pegmatites are considered to have developed from magma, originating either by fractional crystallization or by differential mobilization. The different zones of the zoned pegmatites are discussed, and the distribution of main and accessory minerals is studied from a statistical point of view.

P. Lggn.

DEJOIT (W. M.). *On the form and mode of emplacement of the Ben Buie intrusion, Island of Mull, Argyllshire*. Geol. Mag., 1959, **96**, 393–402, 4 figs.

A sketch-map is given of the basic intrusion (which covers six and a half sq. miles) together with sections constructed from a detailed field study of the relationship between the intrusion and its partially-preserved roof. The act of intrusion is related to the general sequence of events in the early caldera of Mull. It is concluded that the intrusion is a chonolith, i.e., similar to a laccolith but discordant.

G. M. B.

WALKER (G. P. L.). *Some observations on the Antrim basalts and associated dolerite intrusions*. Proc. Geol. Assoc., 1959, **70**, 179–205, 9 figs.

An account of observations made on the general structural characters of the Tertiary basalt lavas and minor intrusions which occupy 1500 sq. miles in north-east Ireland. The individual flows average 22 ft in thickness, the thickest reaching 150 ft. Four composite flows are described, each consisting of a lower picrite basalt and an upper olivine basalt component separated by a sharp but chilled contact. One of the numerous dykes associated with the lavas is shown to have been the feeder to a flow. Six dolerite plugs have been newly discovered, bringing the total to thirty. The plugs (av. diam. 200–300 yds) mostly are elongated parallel to the regional dyke swarm, and it is suggested that they formed through lava outpourings being confined to short lengths of a fissure eruption, subsequent

enlargement of the fissure taking place at these conduits. Chemical analyses are given of two sodalite-bearing pyroxene pegmatites from veins and patches within the lower picritic component of a composite flow, of the picrite basalt within which the pegmatites occur, and of the olivine basalt and picrite basalt components of another composite flow. [M.A. **14**–151, 210]

G. M. B.

BYRAMJEE (RUSTUM). *Sur le complexe éruptif de Denat, Adrar des Iforas (Sahara méridional)*. C.R. somm. Soc. géol. France, 1958, **8**, 233–235.

The structure of the Denat mass is of ring-dyke form, and the mass is composed of coarse grained rocks and lavas.

E. J. & A. S.

POLLETT (J. D.). *Report of the Geological Department for 1957. Sierra Leone*, 1959, 16 pp.

Pp. 5–7 : The Colony gabbro, in the form of an inverted cone, is made up of four sheet-like intrusive bodies in each of which there is gravity gradation formed, while the mass was partly molten, through the sinking of heavier minerals. The gradation may have been disturbed by the stoping of solidified material into the roof and by minor intrusions after the intrusive sheet had solidified. To north, south and west the contact is under the sea ; to the east it is buried by sediments. Drill holes show that the buried eastern contact against quartz amphibolite is gradational, sheets of gabbro being interlayered with sheets of pyroxene-amphibolite.

K. C. B.

Petrology : Petrogenesis

UFFEN (R. J.). *On the origin of rock magma*. Journ. Geophys. Res., 1959, **64**, 117–122, 5 figs., 2 tables.

It is suggested that rocks at depth are heated during compression and that melting occurs when the pressure is partially relieved by fracturing.

F. R. B.

OSBORN (E. F.). *Role of oxygen pressure in the crystallization and differentiation of basaltic magma*. Amer. Journ. Sci., 1959, **257**, 609–647, 14 figs.

Two types of crystallization paths in iron oxide systems are illustrated by describing equilibrium crystallization in the fayalite field of the system $\text{FeO-Fe}_2\text{O}_3\text{-SiO}_2$. In one type, where total composition of the mixture remains constant, composition of the liquid changes along a path leading to a boundary curve and thence to an invariant point. In the other type oxygen partial pressure remains constant causing the liquid of the crystallizing mixture to follow an oxygen isobaric line on the liquidus surface, the oxygen content of the mixture changing. These principles are extended to the examination of crystallization in the

system $\text{MgO-FeO-Fe}_2\text{O}_3\text{-SiO}_2$ in which mix-crystal formation requires that fractional crystallization also be taken into account. Analyses applicable to igneous rocks are plotted for comparison with curves of fractionating liquids in the system. [M.A. 13-114, 14-39] A. P.

PERRIN (RENÉ). *Sur le granite de Flamanville*. Bull. Soc. géol. France, 1958, 8, 397-406.

A new exploration of the contacts of the Flamanville granite confirms the author in his conception of its genesis by granitization in situ. He brings forward some observations in demonstration, supporting them by sketches 'quelque peu approximatifs quant aux dimensions, et même légèrement schématique dans les zones complexes'. No mineralogical, microscopic, or chemical study accompanies this field work. E. J. & A. S.

BAILEY (E. B.). *Mobilisation of granophyre in Eire and sinking of olivine in Greenland*. Liverpool & Manchester Geol. Journ., 1959, 2, 143-154.

A re-interpretation of age relationships between dolerites and granophyre in the Carlingford complex, and of the olivine distribution in a picritic sill, Ubekendt Ejland, West Greenland. [M.A. 13-409] W. J. W.

DEICHA (GEORGES). *Contribution a l'étude des témoins d'actions pneumatolytiques d'âge alpin: résultats d'observations dans les Alpes Lépointiennes*. Bull. Soc. géol. France, 1958, 8, 633-640.

Evidence is given of the abundance of fugitive constituents in the liquid inclusions in the quartz of a region famous for the importance of the Alpine metamorphism of the Mesozoic sediments. Comparison is drawn with adjoining areas, and the petrogenetic and tectonic significance of the action of these CO_2 -rich fluids is discussed. E. J. & A. S.

GJELSVIK (TORE). *Albittrike bergarter i den karelske fjellkjede på Finnmarksvidda, Nord-Norge*. Norges Geol. Unders., 1958, 203, 60-72, 3 figs.

Various rocks in the western part of Finnmarksvidda show strong enrichment in albite. It is suggested that the intrusive soda-rich rocks are derived from palingenic magmas which have inherited the richness in Na_2O from geosynclinal or early orogenic spilitization processes. [See following abstract] I. W. O.

GJELSVIK (T.). *Extremely soda rich rocks in the Karelian zone, Finnmarksvidda, Northern Norway. A contribution to the discussion of the spilitic problem*. Geol. Fören. Förh. Stockholm, 1958, 80, 381-406, 16 figs., 7 tables.

Sodium-rich rocks, partly of spilitic type, from Finn-

marksvidda in northern Norway are investigated, and special attention is paid to a greenstone formation. The sodium enrichment of the rock complex is considered to have taken place as a late- or post-magmatic metasomatism. Gases or emanations from a water-enriched basaltic magma penetrated upwards, and upon passing large masses of geosynclinal sediments some of the potassium of the emanations was adsorbed by clay minerals. In this way a sodium dominance was reached in the emanations, and large-scale albitization could take place in upper levels. 14 complete chemical analyses are given (6 greenschists, 5 diabasic rocks, 1 soda granite, 1 syenite, and 1 argillite), together with 37 Na_2O and K_2O analyses. The origin of leucodibases is discussed, both from magmatic and metasomatic points of view. A series of soda granites is considered to have arisen through deep-seated differentiation of a palingenic magma, formed at the expense of spilitic rocks. [See previous abstract; M.A. 14-518] P. Lggn.

REITAN (P.). *Pegmatite veins and the surrounding rocks. III. Structural control of small pegmatites in amphibolite, Rytterholmen, Kragerøfjord, Norway*. Norsk Geol. Tidsskr., 1959, 39, 175-195, 15 figs. IV. *Genesis of a discordant pegmatite vein, St. Hansholmen, Risa, Norway*. Ibid., 197-229. 14 figs.

The pegmatites and amphibolite are described petrographically. Structural studies indicate that the pegmatites formed by metamorphic differentiation. This theory is discussed. Basified zones in the amphibolite adjacent to the pegmatites and the difference between the An % in the surrounding amphibolite and the pegmatites substantiate this conclusion.

Volume change calculations based on modal analyses of the rocks indicate that the material which constitutes the discordant vein entered into a crack across the banded gneiss. It is concluded that the material which filled the crack was derived from the nearby granulite facies rocks. The nature of the pegmatite-forming fluid is considered and four possibilities are discussed: 1, magmatic; 2, hydrothermal; 3, fluidized gas-solid system; 4, disperse phase of relatively high energy particles. Possibilities 2 and 3 are discarded. None of the observations which were made are found to constitute either decisive proof for or evidence fatal to possibilities 1 and 4. K. S. H.

[GINZBURG (I. V.)] Гинзбург (И. В.). Об изменении вещественного состава гранитной магмы, ведущем к образованию литиевых пегматитов [On the change of the material composition of granite magma leading to the formation of lithium pegmatites]. Труды Минер. Музея Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, 10, 45-56, 6 figs.

Based on a number of modal and chemical analyses this work leads to the conclusion that lithium pegmatites cannot be regarded as derived from the direct differentiate of granitic magma, but are due first to the withdrawal of potash through the formation of microcline pegmatites and later to certain specific petrochemical conditions leading to the concentration of lithium.

S. I. T.

AMASAKI (MASAO). *Petrogenetic significance of the K_2O/Na_2O ratios of volcanic rocks of the Fuji and Nasu volcanic zones in Japan.* Journ. Geol. Soc. Japan, 1956, **62**, 504-514, 5 figs.

Data are presented to show that contamination of magma by rocks of granitic composition increases the ratio K_2O/Na_2O of the magma. Volcanic rocks of the Izu Islands which are considered to be free of contamination by granitic rocks show lower K_2O/Na_2O than those of the mainland of Japan. The effect of contamination is held to increase toward the end of the activity of some volcanoes, as judged from the higher values of K_2O/Na_2O in the later lavas.

A. P.

DENAEYER (M.-E.). *Les syénites métasomatiques du massif de Kirumba. Contribution à la lithogénèse des volcans du Kivu (Congo belge).* Acad. roy. Sci. Col., Cl. Sci. Techn., Bruxelles, Mem. in-8°, 1959, **9**, fasc. 2, 234 pp., 12 figs., 24 pls.

A petrographical and mineralogical study of numerous syenites and metamorphic rocks from Kivu; many chemical analyses are given. The rocks of the Kirumba Mass are compared with those from other regions of Kivu and Urundi. The feldspathoid syenites result from soda-metasomatism and desilication of the Urundian mica schists with partial elimination of their potash. An interpretation of the metasomatic reactions and the observed parageneses is given. [M.A. 14-368]

In an appendix, S. Deutsch and G. Poulaert present the results of preliminary study of the radioactivity of some rocks of the masses of Kirumba and Lueshe. The pyrochlores are 10 times more rich in uranium than in thorium.

J. M.

AFANASSIEV (G. D.). *Development of magmatism in a folded region; with special reference to North Caucasus.* Pakistan Journ. Sci., 1955, **7**, 294-301.

From study of the characteristic features of magmatic development, author shows the use of dividing rocks into related complexes within folded regions, such as North Caucasus. He concludes that formation of post-Cambrian magmatic complexes of different age and different compositions is not caused by periodic intrusions of masses from a single permanently acting source but shows process of development of magmatic sources that arise periodically

in deeper parts of earth's crust. He shows 2 intrusive associations of (i) ultrabasic and serpentized rocks, (ii) granodioritic and granitic rocks. Gabbroic rocks in (ii) appear due to contamination of granitic magma with basic material of assimilated rocks. The significance of the study of K-Na feldspar for petrogenesis is asserted.

F. A. S.

REITAN (PAUL H.) & GEUL (J. J. C.). *On the formation of a carbonate-bearing ultrabasic rock at Kviteberg, Lyngen, northern Norway.* Norges Geol. Unders., 1959, **205**, 111-127, 6 figs.

An ultrabasic body within an area of crystalline dolomite, schists, and gneiss contains enstatite, olivine, and dolomite as essential minerals. Two modes of formation of the ultrabasic rock are discussed: 1, injection of an ultrabasic magma which crystallized in place; 2, metamorphic differentiation. In view of the observations it is concluded that the ultrabasic rock at Kviteberg is a metamorphic differentiate.

I. W. O.

JOPLIN (GERMAINE A.). *On the origin and occurrence of basic bodies associated with discordant batholiths.* Geol. Mag., 1959, **96**, 361-373.

A general account of the rock associations, and their field relationships, in batholiths from various parts of the world. It is suggested that the basic and ultrabasic bodies were originally emplaced among geosynclinal sediments, and have since been disrupted and partially hybridized: first, by reaction with water and carbon dioxide released from sediments metamorphosed by a rising acid magma, and secondly, by the granodiorite magma itself. The origin of diorites from this type of environment is discussed briefly in relation to some factors affecting the stability of hornblende.

G. M. B.

Petrology : sedimentary

FRIEDMAN (GERALD M.). *Determination of sieve-size distribution from thin-section data for sedimentary petrological studies.* Journ. Geol., 1958, **66**, 394-416.

Grain-size analyses of thirty-eight rock samples by both sieving and thin-section methods are reported. The discrepancy between the cumulative curves for the two techniques is small. A new graph paper which permits construction of cumulative frequency curves for sieving from thin-section data without mathematical calculations is presented.

H. L.

AREVALO CARRETERO (MG. P.). *Diferenciación óptica de los feldespatos en sedimentos.* An. Edaf. Fis. Veg., 1959, **18**, 541-545, 2 tables.

Diagnosis of feldspars by the oil-immersion method.

M. F.-A.

BLACK (W. W.). *Differential thermal analysis applied to some Lower Carboniferous sedimentary rocks*. Trans. Leeds Geol. Assoc., 1959, **7**, 111–121, 2 figs.

D.t.a. curves are presented for some Lower Carboniferous shales, limestones, and sandstones and the interpretation of the results is discussed. The method is considered a valuable aid in the investigation of rocks consisting of mixtures of clays, carbonates, sulphides, and organic matter, normally difficult to investigate by more usual techniques. J. H.

WELTE (DIETRICH H.). *Geochemische Untersuchungen von organischen Substanzen aus oberkarbonischen Ton-schiefern mariner und limnischer Fazies*. Neues Jahrb. Geol. Paläont., Monatshefte, 1959, 84–89.

It is possible to differentiate between freshwater and marine organic matter by mass spectrometry. The difference seems to be in the structural form of the organic matter rather than in the chemical character. A. P.

HADDING (A.). *Hidden hiatuses and related phenomena. Some lithological problems*. Fysiograf. Sällsk. Förh. Lund, 1958, **28**, 159–171, 6 figs.

Problems concerning submarine denudation and corrosion are dealt with, examples being taken from limestone series. Closely connected with these problems is that of the origin of hidden hiatuses, the formation of which is discussed. Some observations on a particular form of graded bedding—fossil fragments arranged by size and weight—are discussed in connection with the foregoing subjects. G. S.

MAUREL (P.). *Étude minéralogique de quelques marnes noires oxfordiennes*. Bull. Soc. franç. Min. Crist., 1959, **82**, 276–284, 7 figs.

The mineralogy of black marls of Oxfordian age from Red Cliff, near Weymouth, Dorset, and from the Grenoble, Digne, and Villers-sur-Mer districts, France, is shown to be very similar, an average mode being quartz 16%, calcite 25%. The clay minerals are shown by X-ray, d.t.a., electron microscope, and chemical techniques to be mainly dioctahedral illite associated with some kaolinite or chlorite. Chemical analyses of the marls (after treatment with cold dilute HCl to eliminate calcite and gypsum) from the four localities are tabulated. R. A. H.

CAN (H. N.), DONOSO (W.), & SABATIER (G.). *Minéralogie de quelques vases marines de la région de Monaco*. Bull. Soc. franç. Min. Crist., 1959, **82**, 380–383, 2 figs.

A study of 17 specimens of blue marine muds from the Mediterranean, near Monaco, showed them to be very uniform in composition with an average of 42% carbonate

(2–3% MgCO_3) and 16% of quartz. The argillaceous fraction consists of dioctahedral illite (more than 80% chlorite, and sometimes a small amount of montmorillonite). Chemical analyses are given for 5 de-calcified samples. R. A. H.

NORIN (E.). *The sediments of the central Tyrrhenian Sea*. Rept. of the Swedish Deep-sea Expedition, 1947–1958, **8**(1), 1–136, 40 figs., 19 pls., 29 tables.

In the pelitic sediments of the Tyrrhenian Sea the following clay minerals have been identified in decreasing order of frequency: illite (sometimes of vermicular habit), kaolinite, and an expanding 14\AA mineral. In glycerol-treated samples the first-order basal reflexion of the latter mineral is shifted to $17\text{--}18\text{\AA}$, still leaving behind a very weak line at 14\AA . From other X-ray data it is evident that this substance is a mechanical mixture of dioctahedral montmorillonite and chlorite [no corrensite]. The montmorillonite seems to be rich in trivalent iron and poor in magnesium and is decomposed even by weak hydrochloric acid. On electron micrographs the mineral appears as lath-shaped crystals striated parallel to the long axis and often intimately intergrown with micaceous flakes. In some cases lath-shaped individuals are superposed so that the axes enclose an angle of very nearly 60° . A very similar montmorillonite is found in the Epomeo tuff on the Island of Ischia. The high content of trivalent iron, the low resistance to hydrochloric acid, and the lath-shaped habit are characters in common. However, the pronounced difference in colour and the intimate crystallite intergrowths suggest that the Tyrrhenian montmorillonite is not a redeposited mineral but has been formed authigenously. In other specimens of the Epomeo tuff is also reported the occurrence of a mixed layer mineral, the components of which seem to be a ferri-ferrous montmorillonite and celadonite. B. L.

SHUAIB (S. M.). *Investigation of minerals in a sedimentary core from the Gulf of Naples*. Pakistan Journ. Sci. Res., 1956, **8**, 51–55.

A preliminary account of the mineral composition of a 410 cm core. Coarser fraction consists of glass, calcareous matter (in part fossils) with small amounts of common rock minerals. Finer fraction contains illite, kaolinite, montmorillonite. No post-depositional alteration was observed. [M.A. 14–295] F. A. S.

HOFFMANN (KARL). *Die Feuersteine auf der Hochfläche des Aachener Waldes. Eine Typisierung*. Neues Jahrb. Geol. Paläont., Monatshefte, 1959, 310–327, 7 figs.

Residual flints of the region of the Aachen Forest are classified as (1) normal concretionary flint in irregular shapes, (2) flint in bone- or stem-like shapes, (3) quartzite

it in rounded or polyhedral shapes. The latter are variably composed of a rough, porous crust and a denser core, and chemical analyses show crust 95.8 SiO₂, core 92.2 SiO₂%. The characteristics of the 3 types are summarized and contrasted in detail in a table. A. P.

DRAWIETZ (FRANZ-H.). *Ruinen-Marmor*. Neues Jahrb. Geol. Paläont., Monatshefte, 1958, 49–53, 2 figs.

From the examination of a hand specimen of the ruin-marble of Florence an explanation of its features different from that of B. M. Schaub [Amer. Journ. Sci., 1953, **251**, 2–605] is given. The ruin-marble is a marly limestone divided into many wedge-shaped blocks by narrow, post-tectonic, calcite-filled cracks. Later meteoric waters produced ferric oxide giving rise to banding which varies from block to block because of impaired lateral circulation. A. P.

CHAUBERGER (O.) & KÜHN (R.). *Über die Entstehung des Alpinen Augensalzes*. Neues Jahrb. Geol. Paläont., Monatshefte, 1959, 247–259, 4 figs.

Nodules of coarse halite, known as 'Augensalz', concentrated in certain beds in the alpine salt deposits, generally have a higher Br content than the associated rock salt as shown by a summary of analytical data for 18 pairs of specimens from the Austrian Alps. From this it is concluded that the nodules cannot have formed by recrystallization but represent blocks of older rock salt that became embedded in younger salt deposits. A. P.

NEURICH (HORST). *Zur Frage der Vergipsung in den Sulfatlagerstätten des Mittleren Muschelkalks und Gipskeupers in Südwestdeutschland*. Neues Jahrb. Geol. Paläont., Abhandl., 1958, **106**, 293–338, 12 figs., 4 pls.

Sulfate beds in the middle Muschelkalk and the Gipskeuper of southwest Germany were formed as gypsum deposits and later converted to anhydrite under load. At present anhydrite is being converted to gypsum wherever water has access to the deposits. The development of karst topography in the region of sulfate rocks and the conditions for the persistence of remnants of anhydrite in the region of gypsification are described in detail. A. P.

МИРОШНИКОВ (L. D.) & ШЧЕГЛОВА (O. S.). [Мирошников (Л. Д.) и Щеглова (О. С.). О концентрации воднорастворимых сульфатов на полуострове Челюскина [Concentrations of water soluble sulphates on Cape Chelyuskin]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 686–692, 7 figs.

Chemical, thermal, and X-ray studies revealed the presence of minerals of the type of melanterite, fibroferite, luminite, alunogen, and others cementing breccias in Silurian shales and siltstones. S. I. T.

ZEN (E-AN). *Carbonate mineralogy of the Lower Ordovician Burchards limestone in west-central Vermont*. Amer. Journ. Sci., 1959, **257**, 668–672.

The mineralogy of mottled limestones and associated dolostones of the Lower Ordovician Burchards limestone in west-central Vermont was quantitatively studied by X-ray diffraction. The dolomitic mottled patches consist of dolomite and calcite and the bulk composition is consistently about 30% MgCO₃, verified by wet chemical analysis. A. P.

FOLINSBEE (R. E.). *Archean monazite in beach concentrates, Yellowknife geological province, Northwest Territories, Canada*. Trans. Roy. Soc. Canada, sect. 4, 1955, **49**, 7–24, 5 figs., 2 tables.

This paper gives the results of a detailed mineral analysis of beach placers formed from esker sands in the Lac de Gras map area, 250 miles northeast of Yellowknife, N.W.T. The injection-gneiss or migmatite, source of the monazite in the Yamba Lake placer, is assigned to the Archean (2200–2400 m.y.) on the basis of field relations confirmed by K–Ar and other age-dating methods. E. W. N.

IJIMA (AZUMA). *Preliminary note on the heavy-mineral association of the Ishikari series (Eocene-Oligocene) in the Ishikari, Kabato and Rumoi coal fields in Hokkaido, Japan*. Journ. Geol. Soc. Japan, 1957, **63**, 67–81, 4 figs., 1 pl.

The heavy mineral contents of 68 samples of sandstone from four localities, representing eleven named formations, have been determined. 28 species and varieties are distinguished. The stratigraphic and palaeogeographic relations are discussed. A. P.

PALACAS (J. G.), SWAIN (F. M.), & SMITH (F.). *Presence of carbohydrates and other organic compounds in ancient sedimentary rocks*. Nature, 1960, **185**, 234.

Sugars and amino-acids have been identified by paper chromatography in bituminous sediments ranging in age from Ordovician to Miocene. D. McK.

МЫКУРА (W.). *The replacement of coal by limestone and the reddening of Coal Measures in the Ayrshire coalfield*. Bull. Geol. Survey Gt. Britain, 1960, **16**, 69–109, 4 figs., 5 pls.

Distribution of the reddened rocks and the replaced coal seams suggests that the alteration of coals takes place within a fairly restricted belt in the reddened zone. Chemical data and photomicrographs illustrate various stages of alteration to dolomitic limestone. The reddening of the strata and the alteration of the higher coals is considered to have taken place before the eruption of Permian

lavas, the subsequent weathering of which may have provided the percolating solutions responsible for the rapid alteration of coals to carbonate near the lower limit of oxidation.

R. D.

Petrology : metamorphic—thermal, &c.

KING (R. J.). *The mineralization of the Mountsorrel granodiorite*. Trans. Leicester Lit. Phil. Soc., 1959, **53**, 18–30, 1 pl.

The granodiorite of the igneous complex of Mountsorrel, Leicestershire, has been affected by pneumatolytic and hydrothermal activity. Five stages of igneous mineralization are recognised. Pneumatolytic stage (1) gave rise to pyrite and molybdenite in aplite veins; pneumatolytic (2) to molybdenite, allanite, sphene, tourmaline, chlorite, quartz, pyrite, pyrrhotine, and topaz; hydrothermal (1) to dolomite, epidote, quartz, chalcopyrite, pyrite, galena, calcite, hematite, and baryte; hydrothermal (2) to calcite and pyrite associated with the injection of orthophyre dykes; hydrothermal (3) to calcite, dolomite, magnesite (?), pyrite, marcasite, goethite, a nacritic clay mineral, chlorite, epidote, quartz, and an asphaltic compound. In addition a sixth or supergene stage has introduced jarosite, selenite, epsomite, alunogen (?), limonite, hydrohematite, and malachite.

R. A. H.

WYLLIE (P. J.). *Microscopic cordierite in fused Torridonian arkose*. Amer. Min., 1959, **44**, 1039–1046, 2 figs.

Progressive metamorphism of Torridonian arkose by a picrite sill in Soay (Scotland) culminated in extensive fusion. Microlites of cordierite formed as six-sided prisms with abundant magnetite inclusions; refr. ind. lie between 1.529 and 1.541 and 2V (—) is small. The cordierite is frequently twinned on (110) and rare cruciform twins are present. The distortion index, Δ , determined from the X-ray powder diffraction pattern, is 0.08 [M.A. **13**–546]. Presumably for occurrences of a particular type the distortion index is an indicator of the structural state of the cordierite. From the P - T relations of the quartz–tridymite inversion, the fusion of the arkose, and the conditions when the liquid was quenched to a glass it is concluded that the maximum P_{H_2O} was 430 kg/cm² and that the cordierite crystallized between 935° and 1025°C.

A. P.

PADGET (P.). *Leucodiabase and associated rocks in the Karelidic zone of Fennoscandia*. Geol. Fören. Förh. Stockholm, 1959, **81**, 316–332, 6 figs., 3 tables.

The leucodiabases of northern Sweden are considered to have arisen through a large-scale metasomatism of pre-existing basic rocks within the immediate neighbourhood of zones of faulting. The metasomatic solutions came from

residual aqueous fractions rich in Na and CO₂, which originated in a magma chamber after a prolonged period of basic volcanic activity. Both albitization and scapolitization took place. Comparisons are made with similar regions in Norway, Finland, and the Karelian part of U.S.S.R. The origin of small ore deposits related to the leucodiabases is discussed, and their structural features pointed out. [M.A. **14**–514].

P. Lggm.

GEIJER (P.). *Några aspekter av skarnmalmsproblemen i Bergslagen*. Geol. Fören. Förh. Stockholm, 1959, **81**, 514–534, 1 fig. (Abstract in English)

The non-manganiferous skarn-bearing iron ores of Central Sweden contain 'primary skarn ores' of pyrometasomatic origin, and 'reaction skarn ores'. The latter formed originally by sedimentation or by replacement at moderate temperatures, and were later changed through interreactions initiated by regional heating. Magnusson (1955) indicated that primary skarn ores may all be reaction skarn deposits altered by magnesia metasomatism. The author demonstrates that the association of certain primary skarns with borates is well-known from other regions, where the primary nature of the skarns seems to be well-established. The non-manganiferous reaction skarn ores occur chiefly in areas of extremely sodic leptites where ordinary quartz-banded ores are rare, and the sedimentary deposition of iron and silica took place only in close connection with such carbonate rocks. True stratification of sedimentary origin is certainly common in reaction skarn ores but caution is necessary when extending this interpretation, as selective replacement may produce similar results.

P. Lggm.

[GINSBURG (A. I.)] Гинзбург (А. И.). К вопросу о взаимодействии вмещающих пород и гранитных пегматитов натро-литиевого типа [Contribution to the problem of reaction between the country rock and the granite pegmatite of soda-lithium type]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 53–59, 1 table.

Assimilation processes at the contacts between the sodic lithium pegmatites and the country rock are discussed. It is suggested that Li, K, and some Na, F, P, and B migrate out of pegmatites giving rise to: muscovitization, tourmalinization, apatitization, etc., of granites and slate; biotitization, chloritization, etc., of gabbros; phlogopitization, fluoritization, and the production of calc-silicates in limestones. Conversely, calc-silicates are produced in the pegmatite according to the nature of the country rock, since Fe, Mg, Ti, Ca, and some V, Cr, Ni, Co, Ba, and Sr may migrate into the pegmatitic fluid.

N. R.

ТИМЧЕНКО (Т. И.) Тимченко (Т. И.). Процессы изменения берилла в пегматитах Восточного Забайкалья [*Processes of alteration of beryl in pegmatites of the Eastern Transbaikalian region*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 138–145, 8 figs., 1 table.

The pegmatites under consideration vary from tourmaline- and biotite-bearing varieties to albitized types and others containing lithium and phosphate minerals. They are intruded into the middle Palaeozoic grits and slates. Beryl occurs in all these pegmatites but is particularly prone to alteration in the first two varieties. The alteration can be of two kinds: in one, beryl is replaced by bertrandite and muscovite; in the other, potash feldspar and phenakite are the main alteration products. Introduction of SiO_2 , K_2O and H_2O during a late hydrothermal phase is held to be responsible for the alteration. Some optical, d.t.a., and X-ray data are given.

N. R.

МОЗГОВА (Н. Н.) & ЧЕТВЕРИКОВ (С. Д.) Мозгова (Н. Н.) и Четвериков (С. Д.). О даннеморите из месторождения Тетюхе [*Dannemorite from Tetyukhe deposit*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 154–163, 4 figs.

Certain cavities in the skarn deposits of Tetyukhe, Maritime Province, contain white crusts and cotton-like aggregates of a fibrous mineral. On analysis this gave SiO_2 47.16, Al_2O_3 3.76, Fe_2O_3 2.86, FeO 30.91, MnO 5.49, MgO 2.96, CaO 5.82, Na_2O 0.10, K_2O 0.21, H_2O 0.43, H_2O^+ 99.70; sp. gr. 3.2663; α 1.686, γ 1.706, $c:\gamma$ 8°–14°. X-ray and thermal data show resemblances to various types of amphibole, but the general conclusion is that this particular mineral must be regarded as dannemorite.

S. I. T.

СЕРГЕЕВ (А. С.) Сергеев (А. С.). Фениты и процессы фенитизации в контактовом ореоле щелочных и ультраосновных интрузий Хабозерской группы (Кольский полуостров) [*Fenites and fenitization in the contact aureole of alkaline and ultrabasic intrusions of the Khabosersky group (Kola peninsula)*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 430–443, 10 figs.

Various intrusions of ultrabasic rocks, such as ijolite, melteigite, nepheline pyroxenite, and olivinites are described as well as later veins of syenite and carbonatite. Fenitized gneiss contacts around these intrusions are studied in detail and six chemical analyses are given. The stages of fenitization begin with the albitization of feldspar and amphibolitization of pyroxene and end with the leaching of the rock and formation of zeolites and carbonates. The order of migration of chemical elements in the exocontact zone is outlined.

S. I. T.

СТЕПАНОВ (В. И.) Степанов (В. И.). О замещении топаза опалом [*On the replacement of topaz by opal*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 476–481, 4 figs.

Topaz, wholly or partly replaced by opal, jarosite, and hydromica, is found in quartz and feldspar veinlets cutting biotite-quartz hornfels in a tungsten deposit of Central Kazakhstan. Opal was studied by spectroscopic, X-ray, and thermal methods and its formation is discussed.

S. I. T.

БАТАЛОВ (А. В.) Баталов (А. В.). О брусите из Ирису. [*On the brucite from Irisu*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 485–487, 2 figs.

Brucite, in association with diopside and other minerals, occurs in veinlets in marble forming the exocontact zone of copper pyrite-magnetite ore deposit of Irisu, Talass Alatau, Central Asia. Brucite occurs in the form of tabular crystals, n_D 1.560, n_E 1.579, uniaxial, positive. Results of X-ray and thermal studies are given.

S. I. T.

ДЕМБОВ (Т. М.) Дембо (Т. М.). Диоритизация порфириновой дайки в экзоконтактной зоне гранодиоритового массива [*Dioritisation of a porphyrite dike in the exocontact zone of a granodiorite massif*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 488–490.

The dyke described occurs near Novy Berikul, Kuznetsk Alatau. It is intruded into limestone of Cambrian age which at the contact with granodiorite is transformed into marble, while the dyke is transformed into a brecciated diorite.

S. I. T.

ШАМС (Ф. А.). Vesuvianite from Hindu-Bagh (Baluchistan). Part 1—An X-ray investigation. Pakistan Journ. Sci. Res., 1955, **7**, 35–37.

Vesuvianite, accompanied by chlorite, is found in cracks in a limestone body surrounded by serpentinite. Preliminary X-ray work shows unit cell constants c 15.326 Å, a 11.886 Å, $V=278.82 \text{ cu Å}$, $Z=4$. Optical work shows pronounced penetration twinning and biaxial character. The mineral is therefore 'pseudotetragonal'.

J. Ph.

FRANCO (RUI RIBEIRO). Contribuição ao conhecimento de rochas termometamórficas da série S. Roque. Univ. São Paulo Fac. Fil. Cien. Let., 1958, Bol. **189**, Min. no. 14, 81 pp., 35 figs., 8 photomicros. (Portuguese with English summary.)

A descriptive and paragenetic account of the skarn and contact rocks associated with granitic intrusions at localities in São Paulo State. The country rocks comprise schists, quartzites, calcsilicate and carbonate rocks, and amphibolites (genetically related to basic igneous rocks). Tourmalinization is widespread; introduction of alkalis (São Roque)

and of iron and copper (Itaóca) local. The sequence at Itaóca is skarn with hedenbergite, introduction of chalcopyrite and bornite, followed by quartz, and secondary epidote, chalcedony, azurite, and malachite. Definitions of the author's usage of 33 petrographic terms are given, pp. 13-17. J. Ph.

Petrology : metamorphic—regional, general

[BOGOLEPOV (V. G.)] Боголепов (В. Г.). Об активном и пассивном поведении элементов при метасоматозе [*On the active and passive behaviour of elements involved in metasomatism*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 730-732.

It is suggested that the 'active' components involved in metasomatism are those which can influence quantities of newly formed minerals, while 'passive' components are those which influence their qualities only. The problems raised by D. S. and A. F. Korzhinsky [M.A. **14**-162, 301] relating to metasomatic processes are discussed.

S. I. T.

[SOLOVIEV (S. P.)] Соловьев (С. П.). Особенности развития во времени метаморфических горных пород на территории СССР [*The main features of the development in time of metamorphic rocks on the territory of U.S.S.R.*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 637-655.

This is a generalised review of the regional metamorphic and contact-metasomatic rocks in the U.S.S.R. and their distribution in space and in time. The depth of metamorphism and the associated chemical elements are also discussed.

S. I. T.

KOLDERUP (N.-H.). *Origin of Norwegian eclogites in gneisses*. Norsk Geol. Tidsskr., 1960, **40**, 73-76, 1 fig.

Eclogitic rocks occurring on the west coast of Norway are discussed. The preliminary conclusions about their origin are; 1, the eclogites in the gneisses are true fragments, detached from larger bodies of eclogite rocks; 2, the eclogites and eclogite amphibolites are metamorphic derivatives of Caledonian gabbros and basalts. K. S. H.

DIETRICH (R. V.). *Banded gneisses of the Randsund area, southeastern Norway*. Norsk Geol. Tidsskr., 1960, **40**, 13-63, 8 figs.

Chemical analyses of two groups of three adjacent bands of banded gneisses (total 6 rock analyses, major elements) are given together with Na₂O and K₂O determinations for 11 potassium feldspars. Most of these banded gneisses appear to be essentially isochemically metamorphosed supracrustal rocks. Some also exhibit the results of chiefly chemical metamorphic differentiation; some bands have undergone marked cataclasis; some bands contain

K-feldspar grains of which at least some of the constituents have moved into their present relative positions since the original supracrustal materials were deposited; and some bands possibly have undergone partial anatexis. Nearly all the gneisses show evidence of having undergone structural deformation with development of characters generally considered to represent 'flow zone' conditions. Of importance for general petrological considerations are the temperature determinations by using the two-feldspar geothermometer, the partial checking of certain aspects of the validity of this thermometer, and the use of some semiquantitative spectrographic trace element analyses of amphibole-rich bands of the Randsund area gneisses. [M.A. **14**-425]

K. S. H.

HEIER (KNUT S.). *Petrology and geochemistry of high-grade metamorphic and igneous rocks on Langøy, Northern Norway*. Norges Geol. Unders., 1960, **207**, 1-246, 4 figs., 1 folding geol. map.

The paper is based on geological mapping of the greater part of Langøy, one of the large islands in the Vesterålen group, and examination of rock types by microscopic and chemical—including spectrochemical—methods. The area is situated within the zone of Caledonian orogeny. The rocks, earlier interpreted as an igneous series including metamorphic sedimentary rocks, are now shown to be high-grade metamorphic rocks with some younger igneous bodies and dikes. They range in composition from ultrabasic to granitic; charnockitic and monzonitic types are important. Most of the rocks are banded or gneissic. A thrust plane in the eastern part of the area defines a metamorphic facies boundary dividing a western granulite facies from an eastern amphibolite facies, the rocks on both sides being chemically similar. Chemical analyses for both major and trace elements are given for 43 rocks, 26 potash feldspars, 8 plagioclases, and 7 biotites, and the material is discussed in great detail. It is concluded that the chemistry does not in general give any conclusive information about the origin of such highly metamorphic rocks, but some of the volatile elements show relation to the metamorphic grade. Temperatures of formation derived by the 'Barth feldspar geothermometer' are given, and some other possible geothermometers (distribution of Pb, Sr, Ba, etc., between minerals in equilibrium) are discussed. Some regularities in the distribution of trace elements are reported, e.g., that Pb is higher in plagioclase than in the coexisting potash feldspars both in granulite facies and in amphibolite facies rocks.

I. W. O.

REITAN (PAUL). *Pegmatite veins and the surrounding rocks II. Changes in the olivine gabbro surrounding the pegmatite veins, Risør, Norway*. Norsk Geol. Tidsskr., 1958, **38**, 279-311.

The pegmatite veins and the surrounding rocks are described petrographically. Changes in the chemical composition of the surrounding rock as a function of distance from the pegmatites were calculated from modal analyses of 20 samples. Near each of the veins there exist zones of markedly increased basicity. A discussion of the distribution of pressure near a break in a competent rock (e.g., gabbro) surrounded by a rock flowing plastically (e.g., gneiss) during the dynamic regional metamorphism leads to the conclusion that pressure differences would be created such that thermodynamic gradients would necessitate the migration of material from zones of relatively high pressure to zones of relatively low pressure, and minerals of large mol. volumes would be preferentially formed in the zones of low pressure. The pegmatite veins and the adjacent zones of increased basicity are interpreted as the result of a process of metamorphic segregation during the dynamic metamorphism of the area. Calculations of the density of cations per unit number of oxygen ions, and calculations of the changes in the volume occupied by a unit number of oxygen ions, based on a method taking into account the mol volumes and the modal percentages of the constituent minerals, confirm this mode of formation. K. S. H.

HENEVOY (MAURICE). *Les phénomènes métamorphiques en Limousin septentrional et leur interprétation dans le cadre du Massif Central*. Bull. Soc. géol. France, 1958, **8**, 339–348.

The crystalline series of northern Limousin—gneiss, mica parashists, volcanic intercalations—is polymetamorphic. Two phases of migmatitization are distinguished; they have a different chemistry and took place at different epochs. The fundamental migmatites lie at the base of the series and are represented by anatexites with sillimanite and cordierite. A feldspathization of regional magnitude is superposed on the earlier and produces layered migmatites. E. J. & A. S.

MILLOT (GEORGES) & VON ELLER (JEAN-PAUL). *Etude des gneiss et granites migmatiques de Kaysersberg des Trois Epis et de Ribeauvillé dans les Vosges*. Bull. Soc. géol. France, 1958, **8**, 437–446.

A field study of the migmatite areas of the Alsatian slope of the central Vosges. The facies of Kaysersberg comprises ribbon-gneisses with microcline and plagioclase, biotite, garnet, and sillimanite or andalusite, and is sometimes crowded with basic enclaves with concentric structure—an outer biotitic zone, an intermediate amphibolite zone, and a pyroxenic core. Every passage exists between this facies and that of the crag of Bixkoepfel, a gneiss with numerous and large porphyroblasts of microcline and plagioclase. A more acid facies is found at Troix Epis, Ribeauvillé, and Alspach; it is composed of leptynites with

cordierite (altered), garnet, and sillimanite, passing locally to granite. The latter migmatites appear to be later than the former. E. J. & A. S.

LAPADU-HARGUES (PIERRE). *Observation à propos des amphibolites*. C.R. somm. Soc. géol. France, 1958, **8**, 132–133.

Metamorphism is accompanied by but little transfer of TiO_2 within the rocks. Mesocratic igneous rocks contain between 1 and 2% TiO_2 ; sedimentary rocks scarcely 0.1% for true carbonate rocks. The critical value for separation of para- and ortho-amphibolites seems to approximate 0.8 TiO_2 . But field and microscopic examination are better guides than this chemical criterion. E. J. & A. S.

WEINELT (WINIFRED). *Petrologische Untersuchungen der Münchberger Gneismasse*. Tschermarks Min. Petr. Mitt., 1958, **6**(3), 282–375, 37 figs.

Rocks of the Münchberg gneiss terrane in northeastern Bavaria have been studied in terms of the concept of metamorphic facies. New chemical analyses are reported for a pegmatitic muscovite gneiss from Gefrees and for a marble and an epidote amphibolite near Wirsberg. Analyses are also reported for the muscovite and epidote in the first and last of these rocks but optical properties and density are recorded only for the epidote. A. P.

DE WAARD (D.). *Anorthite content of plagioclase in basic and pelitic crystalline schists as related to metamorphic zoning in the Usu massif, Timor*. Amer. Journ. Sci., 1959, **257**, 553–562, 6 figs.

Systematic sampling of basic and pelitic schists in the Usu massif has yielded information on the variation of plagioclase composition in the greenschist and almandine amphibolite facies. The frequency of occurrence of plagioclase between An_5 and An_{20} is very low in both basic and pelitic schists, lending support to the choice of the An_{10} boundary between the greenschist and almandine amphibolite facies. The shape of the frequency curve of An percentage of plagioclase in the pelitic schists is similar to that for the basic schists, but at the same metamorphic grade (juxtaposition in the field) the An content tends to be higher in the pelitic than in the basic schists at lower grade, and lower at higher grade. A. P.

YAMAGUCHI (TAKAO). *Mineral facies of the Rensen metamorphic group*. Journ. Geol. Soc. Japan, 1954, **60**, 153–159.

Mineral transformations in a series of metamorphic rocks from Korea are enumerated. It is suggested that colour variations in biotite may be temperature indicators. A. P.

LAWTON (K. D.). *Geology of Boston Township and part of Pacaud Township*. Ann. Rept. Ontario Dept. Mines, 1957, **66**, pt. 5, 55 pp., 13 figs., 6 maps.

One of a series of reports dealing with the Kirkland Lake-Larder Lake gold mining area, this report describes the Precambrian volcanics, sediments, and intrusives of the area in detail. A banded siliceous iron formation, associated with much tuff, agglomerate, and basic lavas, is composed of alternating layers of siliceous magnetite, massive magnetite, sugary quartzite, and cherty quartzite and is highly folded and contorted. Hornblende, tremolite, grunerite, and garnet are present also; a chemical origin is postulated for the deposit.

J. A. M.

HIETANEN (ANNA). *Kyanite-garnet gedritite near Orofino, Idaho*. Amer. Min., 1959, **44**, 539-564, 9 figs.

A series of metamorphic rocks 4 miles east of Orofino, Idaho, includes a rock consisting of gedrite, quartz, oligoclase, garnet, and kyanite, which is designated kyanite-garnet gedritite. Analyses of the rock, the garnet, and the gedrite are reported. The garnet is essentially a high-magnesian almandine, n 1.775, sp. gr. 3.83, a 11.520. The Mg:Fe ratio of the gedrite (α 1.649, β 1.656, γ 1.661, sp. gr. 3.15) is about 2:1, within the range possible for cordierite. The bulk composition of the kyanite-garnet gedritite is very close to those of cordierite gneisses and cordierite-anthophyllite rocks. Comparison is made with related metamorphic rocks of various localities and the conditions for the production of the mineral assemblage described are discussed at length.

A. P.

TOPOGRAPHICAL MINERALOGY

HARTLEY (J.). *Jarosite from Carboniferous shales in Yorkshire*. Trans. Leeds Geol. Assoc., 1957, **7**, 19-23.

Jarosite identified by X-ray diffraction is described from Carboniferous shales at 3 localities in Yorkshire, where it is probably the result of surface weathering; d -values obtained with a 19 cm camera (Co radiation), are given.

P. G. H.

HARTLEY (J.). *Goethite from Thorner, near Leeds*. Trans. Leeds Geol. Assoc., 1959, **7**, 100-102.

Tabular crystals, identified by X-ray diffraction as goethite, occur in calcite veins at Thorner, Yorkshire. It is considered that the assemblage is a low-temperature, hydrothermal one, and that the goethite is primary.

P. G. H.

HARTLEY (J.). *Rosasite from Grassington Moor, Yorkshire*. Trans. Leeds Geol. Assoc., 1959, **7**, 103.

Rosasite as wart-like aggregates or lath-like grains, coating massive barytes and identified by X-ray diffraction, is recorded from dumps of a disused lead mine, Chatsworth Mine, Grassington Moor, Yorkshire.

P. G. H.

SVERDRUP (T. L.), BRYN (K. Ø.), & SÆBØ (P. CHR.). *Contributions to the mineralogy of Norway*. No. 2. *Bastnäsité, a new mineral for Norway*. Norsk Geol. Tidsskr., 1959, **39**, 237-247, 5 figs.

Optical and X-ray powder data are given for bastnäsité from four localities in Norway. The refractive indices and birefringences are lower than those reported earlier, $1.691 < \omega < 1.700$, $1.780 < \epsilon < 1.790$ being reported for Øvre Årø material. The crystallographic constants are in close agreement with previously published values, except in one

case where smaller a and c were calculated. The variations in unit cell and optical properties are discussed, but lack of chemical data prevents any conclusive explanation. Bastnäsité has been found as a secondary mineral, most probably as an alteration product of allanite.

K. S. H.

NEUMANN (HENRICH) & SVERDRUP (THOR L.). *Contributions to the mineralogy of Norway*. No. 3. *Bavenite from Boksjoen mineral mine, near Aspedammen in the county of Østfold*. Norsk Geol. Tidsskr., 1959, **39**, 339-342.

The paragenesis and mode of occurrence of bavenite from Boksjoen are recorded. The mineral was identified by optical and X-ray methods. Other recorded localities of bavenite are mentioned. The genesis of bavenite is discussed and the authors consider it a deuteric mineral formed by the reaction of a late pegmatitic hydrothermal solution with beryl. They refer to a personal communication from Brian Mason (1959) stating that the mineral pilinite from Striegau, Silesia (A. v. Lasaulx, 1876) has been found to be identical with bavenite. [M.M. 32-577]

K. S. H.

PLAYLE (B.). *Contributions to the mineralogy of Norway*. No. 4. *New finds of coal blend*. Norsk. Geol. Tidsskr., 1960, **40**, 65-67.

Four new localities of coal blend in the Oslo region are described: 1, with calcite in a vesicle in rhomb porphyry; 2, with calcite and fluorite in a vesicle in rhomb porphyry; 3, with calcite and quartz in a vesicle in basalt; 4, surrounded either by calcite or quartz in vesicles in basalt. Occasionally coal blend completely fills vesicles. A few thin sections of coal blend are described, and some information on other new finds of coal blend is included. [M.M. 14-73]

K. S. H.

EBØ (PER CHR.), REITAN (PAUL H.), & GEUL (J. J. C.). *Stilbite, stellerite, and laumontite at Honningsvåg, Magerø, northern Norway*. Norges Geol. Unders., 1959, **205**, 171–173.

The localities are situated on the island of Magerø, the north point of which is Nordkapp (North Cape). The 3 light minerals were identified by X-ray and optical methods. They occur on joint surfaces. I. W. O.

EBØ (PER CHR.) & REITAN (PAUL H.). *An occurrence of zeolites at Kragersø, southern Norway*. Norges Geol. Unders., 1959, **205**, 174–180.

On two joint surfaces in a quartz-rich gneiss the following light minerals were found: natrolite, stilbite (desmine), alandite, laumontite. The mineral parageneses are discussed. I. W. O.

ENRIQUES (Å.). *Amphitalite a mixture*. Arkiv. Min. Geol. Stockholm, 1958, **2**, 369.

Amphithalite from Hällsjöberget, Värmland, Sweden, where it was originally discovered, has been investigated. Under the microscope the substance was found to be a mixture mainly of augelite with various amounts of apatite, lazulite, other phosphates, rutile, quartz, kyanite, mica, and an epidote mineral. Powder photographs also showed mainly augelite but no other minerals with certainty. K. F.

ENRIQUES (Å.). *Tetragophosphate discredited*. Arkiv. Min. Geol. Stockholm, 1958, **2**, 371–372.

Optical and X-ray investigations of the original samples of tetragophosphate (from Hällsjöberget, Värmland, Sweden) show this mineral to be a recrystallized lazulite. K. F.

GUÉBERT (G.) & PIERROT (R.). *Sur un gisement de pegmatite à Li, Mn, Nb, Ta, Sn et Be dans la région de Crozant (Creuse)*. Bull. Soc. franç. Min. Crist., 1959, **82**, 400.

A pegmatite differentiation in a two-mica granite, in addition to quartz, orthoclase, and muscovite, has cassiterite, columbite ($Ta:Nb=1:2$), manganiferous apatite, triplite, spessartine, lepidolite ($Li_2O \approx 4\%$), topaz, and beryl. R. A. H.

GARIAND (P.). *Deux nouveaux indices de plattnerite (PbO_2 , tetragonal)*. Bull. Soc. franç. Min. Crist., 1959, **82**, 324, 1 fig.

Two new localities for plattnerite are reported from Iran. At the Daré-Zandjir mine, near Yazd [Yazd], it occurs associated with cerussite, hydrozincite, aurichalcite, and smithsonite; at the Tehach-Millé mine, near Anarak, it was found in a large geode of calcite. R. A. H.

PICOT (P.). *Sur la présence de minerais métalliques nickelifères dans les serpentines*. Bull. Soc. franç. Min. Crist., 1959, **82**, 329–334, 12 figs.

Serpentinities from several localities in New Caledonia, Corsica, and the Philippines contain nickeliforous minerals: heazlewoodite is particularly common. Other minerals include millerite and bravoite as alteration products, pentlandite, valleriite, pyrrhotine, martite, magnetite (and heazlewoodite) as products of hydrothermal action, and chromite as an orthomagmatic mineral. [M.M. **29**–374]

R. A. H.

[ZHERU (M. I.)] Жеру (М. И.). Магnezит в мраморах месторождения «Перевал» [*Magnesite in marbles of the deposit at Pereval*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 591–594, 2 figs.

Magnesite crystals are found in the marble at Pereval deposit 7 km from Slyudanka, Baikal region, Siberia. Detailed descriptions of magnesite, forsterite, and talc are given. S. I. T.

JACOBSON (R. R. E.). *Annual report for 1957–58 of the Geological Survey Department, Federation of Nigeria*. 1959, 16 pp.

Mineral samples from Rayfield and Liruein Kaus (Northern Nigeria) have been identified as helvine.

K. C. B.

STEVENSON (J. S.) & STEVENSON (L. S.). *Uranium-rich thorianite from Pontiac County, Quebec*. Trans. Roy. Soc. Canada, sect. 4, 1954, **48**, 105–110, 3 figs.

Uranothorianite, not previously reported from Quebec, occurs as lustrous black crystals and grains measuring 0.1 to 0.2 mm associated with coarsely crystalline salmon-pink calcite, phlogopite, and diopside, in Grenville limestone at Huddersfield township, Pontiac County, Quebec. Uranothorite was found in a pegmatite dyke-rock mined for phlogopite and fluorite. E. W. N.

GROUT (F. F.), SHARP (R. P.), & SCHWARTZ (G. M.). *The geology of Cook County, Minnesota*. Bull. Minnesota Geol. Survey, 1959, **39**, xvi+163 pp., 28 figs., 16 pls., 10 tables, 38 Township maps.

A general geological report. Summaries of the mineralogy of the various Precambrian rocks are presented in Chapter 2. Chemical analyses are included of rocks of the Saganaga batholith, the Rove formation (argillite, graywacke), rhyolite, and diabase porphyry. The Duluth gabbro complex, the basalts, and diabases are described in some detail. Economic geology is covered in Chapter 5 and

includes discussions of the Gunflint iron formation, the titaniferous magnetite of the Duluth gabbro, copper-nickel sulphides, cobalt, and anorthosite. To date the county has produced practically no ore. Each township

description includes a brief summary of the bedrock and Pleistocene deposits along with an outcrop map. Table in the appendix gives locations of known mineral veins.

R. A. Hp.

VARIOUS TOPICS

PARKER (ROBERT L.). *International Mineralogical Association. First General Meeting. Nature, 1959, 184, 1909-1911.*

A brief account of symposia on Alpine Mineral Fissures and the Twinning of Crystals. The papers are to be printed in *Estudios Geologicos*, published by the Instituto 'Lucas Mallada' in Madrid.

C. H. K.

TOMKEIEFF (S. I.). *The progress of geology in the U.S.S.R. Liverpool & Manchester Geol. Journ., 1959, 2, 474-502.*

A summary of the history of the development of mineralogical and geological science and of the institutions for teaching, field survey, and laboratory research, is followed by sectional outlines (14) of the progress of Russian work particularly during the last four decades. In the section on geochemistry attention is drawn to the pioneer role of V. I. Vernadsky and A. E. Fersman in the foundation of this science and to the present expansion and intensity of its development in Russia. In the sections on crystallography, mineralogy, and petrology references, with dates, to the early scientists Gadolin, Fedorov, Wulff, Lomonsov, Loewinson-Lessing, and many others are followed by all too brief mention of the parts being played by contemporary scientists. The rate of expansion of experimental research in mineralogy and petrology is indicated by the number of conferences (5) since 1934. Study of meteorites and research on volcanoes, active and extinct, have special organs for the publication of current work. In each section references to the principal vehicles of publication are given and might with advantage have been listed in the bibliographical postscript.

J. Ph.

GAVELIN (S.). *Synpunkter på urbergsstratigrafin inom grånsområdena mellan Västerbottens och Norrbottens län. Geol. Fören. Förh. Stockholm, 1958, 80, 198-208. (Abstract in English.)*

The stratigraphic succession from part of the region, as given by Kautsky [Sveriges Geol. Unders., ser. C, 1957, 543] is discussed. The interpretation of the Vargfors sediments as being older than the Revsund granite leads to the possible splitting of the Vargfors formation into two series, the one older and the other younger than the Revsund granite. Migmatization within the granitic terrain and feldspar transformations and tectonizations within the

sediments have to a considerable part obscured the age relations. More field data are necessary before a definite conclusion about the age relations can be reached.

P. Lggn.

GELJER (P.). *Några urbergsstratigrafiska frögor i Norrbottens län. Geol. Fören. Förh. Stockholm, 1958, 80, 423-432. (Abstract in English.)*

The monograph on the Precambrian of northernmost Sweden by Ödman [Sveriges Geol. Unders., 1957, ser. C, 41] is discussed. A revised age relation of certain groups (Lina granite, Vakko series, Kurravaara conglomerate, etc.) is given as an alternative to that of Ödman. Amongst the rocks discussed are those of the Kiruna region. P. Lggn.

[GURIEVA (E. YA.)] Гурьева (Э. Я.). О включениях минерала железа в мусковите [On the inclusions of iron minerals in muscovite]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, 10, 86-102, 12 figs.

The shapes of crystals and of the aggregates of pyrite, magnetite, hematite, goethite, hydrogoethite, and other hydroxides of iron, included in muscovite, are described and discussed.

S. I. T.

[GURIEVA (E. YA.)] Гурьева (Э. Я.). Находки битумов в мусковите [Discovery of bitumens in muscovite]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, 10, 148-151, 3 figs.

Pegmatitic micas of the Mamskian region were found to contain small inclusions of a bituminous substance, which was identified as such owing to luminiscence observed with the aid of a special treatment involving the use of ultraviolet light.

N. R.

[DORFMAN (M. D.)] Дорфман (М. Д.). Выпадение опала из водных растворов в одной из горных выработок Кукисвумчоррского апатито-нефелинового месторождения в Хибинских тундрах [The precipitation of opal from hydrous solutions in one of the mining excavations of a Kukisvumchorr apatite-nepheline deposit in the Khibina tundras]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, 10, 142-143, 1 fig.

A white deposit formed in mine water (pH 7) proved to be opal. Previously published experimental work suggests [6-7] as the optimum conditions for the precipitation of silica gel.

S. I. T.

DORFMAN (M. D.), BUSSEN (I. V.), DUDKIN (O. B.) [Дорфман (М. Д.), Буссен (И. В.), Дудкин (О. В.)]. Некоторые данные по избирательному растворению минералов [*Some data on the selective solubility of minerals*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 167-171, 3 tables.

Using varying grain size, temperature, and time, the relative solubilities of a number of minerals (including leucite, zeolites, prehnite, melilite, apatite, and olivine) were studied in different concentrations of acetic, hydrochloric, and nitric acids.

N. R.

POVARENNUKH (A. S.) [Поваренных (А. С.)]. О дегидратации и термической диссоциации минералов [*On dehydration and thermal dissociation of minerals*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 99-106, 4 figs, 2 tables.

Dehydration and thermal dissociation of hydroxides, carbonates, and certain complex hydrous minerals are discussed in the light of atomic theory. It is concluded that the electronegativity of cations, their radii, valency, and the nature of the electron atmosphere are determining factors.

N. R.

ZALASHKOVA (N. E.) & YAKOVLEVSKAYA (T. A.) [Залашкова (Н. Е.) и Яковлевская (Т. А.)]. О низкотемпературном фенаките из гранитных пегматитов Алтая [*On the low-temperature phenakite from granite pegmatites of Altai*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **9**, 172-175, 3 figs., 2 tables.

Both the acicular and the stumpy phenakite are found in a common association, thus denying the supposed low-temperature origin of the former. Certain crystallographic data given.

N. R.

BARSANOV (G. P.) [Барсанов (Г. П.)]. О принципах систематики и классификации метамиктных ниоботанталатов [*Principles of systematics and classification of metamict niobotantalates*]. Труды Минер. Муз. Акад. Наук СССР [Trans. Min. Mus. Acad. Sci. U.S.S.R.], 1959, **10**, 3-16.

Following up a review of the numerous attempts of providing formulae and schemes of classification of niobotantalates, the author comes to the conclusion that the niobotantalates may be divided into normal crystalline

substances having fixed formulae, and metamict, colloidal-like minerals which are made of subdispersed crystalline aggregates with particle sizes of the order of 50 Å and containing indeterminate amounts of adsorbed material. In both divisions two types are distinguished ABX_4 and AB_2X_6 . [M.A. 14-525, BUTLER & HALL] S. I. T.

PIZNYUR (A. V.) [Пизнюр (А. В.)]. Некоторые замечания о характере минералообразующих растворов при образовании хрусталеносных жил Приполярного Урала [*Notes on the character of mineralizing solutions in the formation of crystal veins in Polar Ural*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 473-476, 1 fig.

Temperature-paragenetic diagrams are constructed for vein quartz and other minerals on the basis of study of gas-liquid inclusions contained in these minerals.

S. I. T.

LEBEDEV (V. I.) [Лебедев (В. И.)]. О причинах окисления урана в уранинитах [*Causes of uranium oxidation in the uraninites*]. Зап. Всесоюз. Мин. Общ. [Mem. All-Union Min. Soc.], 1959, **88**, 667-671.

Besides the usual auto-oxidation along the Kirsh-Khlopin reaction which is mostly prevalent in the interior of crystals, oxidation of uranium in uraninites in the outer crystal zones is due to a much greater auto-oxidation arising from the loss of electrons formed during the breakdown of uranium, according to the summary reaction $2\text{UO}_2 \rightarrow \text{PbO} + \text{UO}_3 + 5\text{He} + 3\text{He}^{2+} + 6\text{e}^- + n\gamma$. In this case each crystal of uraninite on acquiring a positive charge is transformed into a sort of anode, provoking a series of radiochemical transformations. In certain cases, however, superimposed processes of oxidation, or processes of partial reduction of UO_3 to UO_2 may take place.

S. I. T.

SHULHOF (WILLIAM P.) & WRIGHT (HAROLD D.). *Unusual galena from the Boulder batholith, Montana*. Amer. Min., 1959, **44**, 1096-1098.

Galena 'B' [Wright & Shulhof, Econ. Geol., 1957, **52**, 115] was found to be a replacement mineral, replacing the uraninite grain for grain.

A. C. H.

BUTLER (J. R.) & HALL (ROSEMARY [A.]). *Chemical variations in members of the fergusonite-formanite series*. Min. Mag., 1960, **32**, 392-407, 8 figs.

Anomalies in the nomenclature of the niobate-tantalates lead to the renaming of the fergusonite series as the fergusonite-formanite series. The individual rare earths in the total rare earth+thorium oxides separated from 10 members of the fergusonite-formanite series from North Carolina, Norway (4), Ceylon (2), Greenland, South Africa, and Western Australia are listed. Members of the series

usually show excess of heavy lanthanons over light lanthanons, but one specimen from Julianehaab, Greenland, shows high Gd+Tb+Dy. [M.A. 14-525] R. A. H.

HEY (M. H.). *Glottalite is chabazite*. Min. Mag., 1960, **32**, 421-422.

Examination of the one specimen of glottalite [Thomson, 1836] by X-ray methods has shown that its X-ray powder pattern exactly matches that of chabazite. R. A. H.

GEE (GEOFFREY). *Sulphur: a survey of recent work on the physical chemistry of the element*. Sci. Progress, 1955, **43**, 193-210, 6 figs. M. H. B.

TOMKEIEFF (S. I.). *Atomic sizes and bond types in their relation to the periodic system and to the structure of the atom*. Sci. Progress, 1955, **43**, 28-44, 7 figs., 1 pl.

— *Lattice types and packing densities of the crystalline elements and their relation to the periodic system*. Sci. Progress, 1956, **44**, 38-52, 7 figs.

In the first paper, using a spiral form of the periodic table [M.A. 12-351] as a system of plane coordinates, the ionic bond radii of the elements are plotted as a contour map, which may be modelled as a spiral surface. From this is derived an empirical formula relating ionic radii to periods and groups of the periodic system. Other types of bond radii are plotted similarly and the distribution of bond type with respect to atomic size examined statistically. In the second paper a summary is given of the Bravais lattices [M.M. 30-625], and the structural types and packing densities of the crystalline elements are mapped over the spiral periodic table. The distribution of the elements, minerals, and 'substances' amongst the crystal systems is given and the relation between symmetry number [number of faces of the general form] and packing density for the elements and the principal chemical groups of minerals is displayed. M. H. B.

HILLERT (M.) & LANGE (N.). *The structure of graphite filaments*. Zeits. Krist., 1958, **111**, 24-34, 8 figs.

Artificial graphite filaments from 100Å to 0.2 mm in thickness have been examined by petrographic and electron microscopy and by X-ray and electron diffraction. The thin threads usually have a circular cross section and are hollow; it is considered that the thick threads were formed by a radial growth of the very thin threads. R. A. H.

KLEBER (W.) & VERWORNER (O.). *Über Kristallisation und Epitaxie von Kaliumnitrat*. Zeits. Krist., 1959, **111**, 435-450, 9 figs.

The crystallization of KNO₃ from aqueous and other solutions and its deposition on aragonite and calcite are discussed.

It is concluded that epitaxy does not necessarily promote the appearance of unstable modifications. R. A. H.

HILDEBRANDT (G.). *Gekrümmte Röntgenstrahlen in schwach verformten Kristallgitter*. A. Laue-Fall der Interferenz. Zeits. Krist., 1959, **112**, 312-339, 14 figs.

— *Gekrümmte Röntgenstrahlen im schwach verformten Kristallgitter*. B. Bragg-Fall der Interferenz. Ibid. 340-361, 12 figs.

Observations are made on radiation entering and leaving a calcite plate in the Laue setting and entering a calcite plate on a side face and emerging on a basal plane in accordance with the symmetric Bragg case. It is found that when the calcite is weakly deformed by a temperature gradient, interfering X-rays travel on curved paths. The main reason for the curvature is the curvature of the reflecting lattice plane, but the curvature of the rays is about 10⁴ times as great as that of the lattice. R. A. H.

PANDYA (N. S.) & PANDYA (J. R.). *Etching of calcite*. Nature, 1959, **184**, 894-895, 3 figs.

Some typical results of experiments carried out with different etching reagents are reported. Detailed results are to be published elsewhere. C. H. K.

GIVEN (P. H.). *Structure of bituminous coals: evidence from distribution of hydrogen*. Nature, 1959, **184**, 980-981, 1 fig. C. H. K.

LEVENGOD (W. C.). *Structural defects in fused and crystalline silica*. Nature, 1959, **184**, 1476-1477, 1 fig. C. H. K.

JACOBS (J. A.). *Continental drift*. Nature, 1960, **185**, 231-2.

Since the average heat flow from oceanic and continental areas is approximately equal and the nature of the crustal rocks quite different, it is concluded that the constitution of the upper part of the mantle must be different beneath the oceans and beneath the continents. This makes it difficult to see how continental drift can have occurred unless the continents drag the uppermost mantle with them, which seems unlikely. D. McK.

KNILL (J. L.). *Evidence for Tertiary crustal distortion in mid-Argyll*. Nature, 1960, **185**, 234-235.

Deflection of the Old Red Sandstone dyke swarm, of a set of tear-faults, and of the strike of the Dalradian country rocks indicates the presence of a Tertiary arcuate flexure on the mainland south-east of Mull, coincident with the main outcrop of the Mull Tertiary dyke swarm. The flexure produces a crustal extension of 2½ to 3½%.

D. McK.

ABBREVIATIONS AND SYMBOLS

used in the text of abstracts

M.M. -- Mineralogical Magazine : M.A. .. Mineralogical Abstracts : A.M. .. American Mineralogist

CHEMICAL & PHYSICAL-CHEMICAL

cation-exchange-capacity	c.e.c.
differential thermal analysis ..	d.t.a.
equivalent U_3O_8	eU_3O_8
ethylenediaminetetra-acetic acid ..	EDTA
heat of formation (absolute temperature subscript) ..	ΔH_f
ionic potential, e.g.	pH
insoluble residue	insol. res.
isotopes, e.g.	^{40}A , ^{40}K
loss on ignition	ign. loss
milliequivalent	me.
microgramme	μg
million-years	m.y.
not determined	n.d.
not found	nt. fd.
not present	nil
parts per million	p.p.m.
strength of solution, normal	N
— — — molar	M
substances in ionic state	
anions, e.g.	Cl^- , SO_4^{2-}
cations, e.g.	K^+ , Fe^{3+}
valency, e.g.	Cl^I , Fe^{II} , Fe^{III}

CRYSTALLOGRAPHIC & STRUCTURAL

Ångstrom unit (10^{-8} cm)	Å
crystal axes	a , b , c
— face indices	{hkl}
— form indices	{hkl}
— zone indices	[hkl]
indices of X-ray diffractions ..	hkl
intensity,	I
— relative	I/I_0
interplanar spacing	d
mica structural polymorphs ..	$1M_1$, $2M_1$
Siegbahn units	kX
space group. These words will be written in full	
unit cell, formula units	Z
— — repeat distances	a , b , c
— — reciprocal lattice lengths of edges	a^* , b^* , c^*
— — interaxial angles	
direct lattice	a , β , γ
— — — reciprocal lattice.. ..	a^* , β^* , γ^*

OPTICAL

dispersion, e.g.	$r > v$
extinction angle, e.g.	$\gamma : c$
optic axial angle	$2V$
— — plane	O.A.P.
refractive index, in text	refr. ind.
— — of isotropic mineral	n
refractive indices	
of uniaxial mineral	ω , ϵ
of biaxial mineral	α , β , γ
sign of biaxiality	
negative	or $2V_x$
positive	+ or $2V_y$

PHYSICAL (other)

calorie	cal.
calorie, large	kcal.
cycles per second	c/s
degree centigrade	$^{\circ}C$
density	D (quote units)
— , relative, e.g.	D^{20}_4
gramme	g
hardness	H.
melting-point	m.p.
micron (10^{-4} cm)	μ
millimicron (10^{-7} cm)	m μ
pounds per square inch	lb/in ²
soluble	sol.
specific gravity, terms of reference not known	sp. gr.
wavelength	λ

SYMBOLS

approximately equal to	\approx
equal to	$=$
equal to or greater than	\geq
equal to or less than	\leq
greater than	$>$
less than	$<$
not equal to	\neq
parallel to	\parallel
per cent.	%
per mille	‰
perpendicular to	\perp
proportional to	\propto

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